ECONOMICS OF ALFALFA SEED PRODUCTION IN KANSAS

by

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IMPORTANCE OF ALFALFA

Alfalfa has been nicknamed "Queen of the Forage Crops" as a tribute to the important role which it plays in the agriculture of the United States. This importance may be partially indicated by the fact that in 1945 almost 15 million acres of alfalfa hay were harvested in the United States.

Only 5 crops are grown on more acres than is alfalfa. These crops are, in the order of their importance, corn, wheat, oats, clover and timothy, and cotton.[1/] If it were possible to separate the "clover and timothy" acreage figure into its component parts, it is entirely possible that alfalfa would then rank 5th as neither clover alone nor timothy alone would occupy as many acres as does alfalfa.

To more firmly indicate the position of alfalfa in the country's agriculture, its position in relation to other hay crops may be examined. In respect to acreage grown, alfalfa ranks second only to clover and timothy. However, in number of tons of hay produced annually, alfalfa ranks first. Also, in farm value of hay produced, alfalfa is the leading hay crop in the United States. Farm value of the 1945 alfalfa hay crop was approximately 593 million dollars.

Likewise in Kansas' agriculture, alfalfa is extremely important. It ranks 5th as a user of cultivated land, nearly 800 thousand acres having been harvested for hay in 1945. The crops using more acres of Kansas cropland than alfalfa

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1/ U. S. Dept. of Agr., Agricultural Statistics. Washington: Government Printing Office, 1946. 1945 preliminary figures are: corn, for all purposes, 91,202,000 acres; all wheat, 64,740,000 acres; oats, 41,503,000 acres; clover and timothy, 21,877,000 acres; cotton, 17,241,000 acres; and alfalfa, 14,840,000 acres.

does are: wheat, corn, sorghums, and oats, in the order named.[1]

The pre-eminence of alfalfa among hay crops is due to 4 outstanding factors as follow:

1. The universal distribution of alfalfa.[2] It is more widely distributed throughout the United States than is any other major hay crop. Ecologically, only the southeastern states are not adapted to alfalfa growing. This is because of their humid atmospheric conditions and their wet, heavy soils deficient in calcium.

2. The per acre yields of alfalfa are consistently higher than those of any other hay crop. This is especially true in areas having a long growing season which allows several cuttings of alfalfa each year.

3. The excellent feeding qualities of alfalfa hay. Chemical analyses show that alfalfa hay contains an average of 14.7 percent protein as compared to corn fodder with 5.9 percent. Based on average yields, alfalfa hay annually produces two-or-more times the amount of digestible proteins per acre as do other common feeds such as clover hay, timothy or timothy-clover hay, corn silage, etc.[3]

4. The place of alfalfa in crop rotations. Alfalfa replenishes the soil with nitrates and organic matter which result in increased yields of crops following in the rotation. Alfalfa is especially useful in rotations of eight or more years in length.

1/ Ibid. 1945 preliminary crop figures for Kansas are: wheat, 13,418,000 acres; corn, for all purposes, 3,036,000 acres; sorghums, for all purposes, 2,976,000 acres; oats, 955,000 acres; and alfalfa, 796,000 acres.

2/ See Fig. 1, p. 3.

3/ F. B. Morrison, Feeds and Feeding (Ithaca, N.Y.: Morrison), 20th ed., 1940, p. 251.

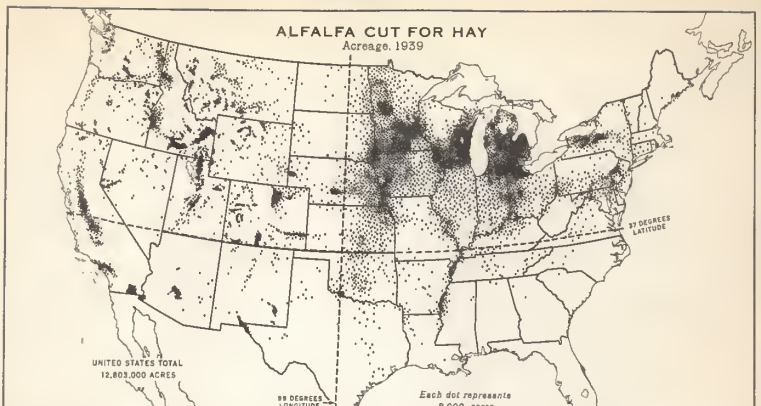

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FIGURE 1

NEG. 39943 BUREAU OF AGRICULTURAL ECONOMICS

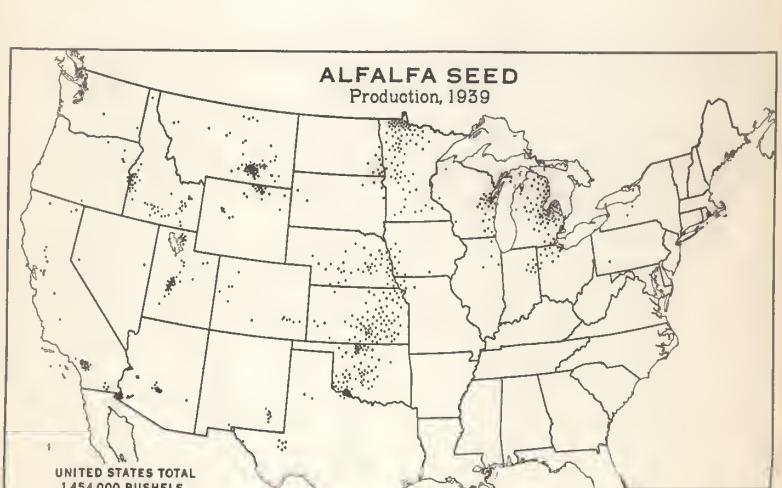

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FIGURE 2

NEG. 42043 BUREAU OF AGRICULTURAL ECONOMICS

Common alfalfa (Medicago sativa) is classified botanically as a perennial legume. Indeed, numerous instances of individual plants or fields of alfalfa living for many years have been observed. In spite of this, it is the normal practice for growers to leave a stand of alfalfa only a limited number of years. Diseases, weather damage, insect damage, and cropping rotations are the more important factors which determine the length of stand of alfalfa in a given field. In general, aging stands have a progressively decreasing number of alfalfa plants per acre and an increasing amount of grass and weeds.

Be it assumed, for purposes of illustration, that the average length of stand is 5 years, then 20 percent of the total acreage of alfalfa would be destroyed each year. In order to maintain a constant alfalfa acreage, an area of land equal to 20 percent of the total alfalfa acreage would therefore have to be planted each year to replace that destroyed. Propagation, or regeneration, of alfalfa plants under field conditions is by seed.

It follows, then, that the production of alfalfa seed is a vital agricultural industry if the alfalfa acreage is to be either maintained or increased.

In turning from consideration of alfalfa seed production in a broad sense to consideration of it from an on-the-farm standpoint, one important point should be brought out. In Kansas, very little alfalfa is grown for the exclusive purpose of seed production. Producing seed is committed to a position complementary to the production of alfalfa hay, economically speaking. In this complementary role, seed production plays an extremely valuable part in a farm's business by usually being at its best when hay production would be poor. This gives valuable supplementary income from alfalfa land when it is needed most.

There is a distinct in-and-out, flexible character to the production of alfalfa seed. In any given year an alfalfa grower either can jump in and

produce a crop of seed, or he can stay out of seed production nature willing, of course, at his own discretion with no change in land use, no additional equipment other than what is usually found on the farm today, and only a slight alteration in management plans as far as labor distribution is concerned. If a producer has decided to produce a seed crop and the weather proves unfavorable, he still is not resigned to accept complete failure on the field for he can make hay from the vegetative growth, thereby receiving returns from the land. Therein lies a real contribution to farm organization.

HISTORY OF ALFALFA AND ALFALFA SEED IN UNITED STATES AND KANSAS

The history of alfalfa in Kansas dates back to shortly after the Civil War when the first fields of the crop were planted. The idea of growing alfalfa was not quickly adopted by the farmers of Kansas in those days. In fact, even by the year 1900 there were less than 300,000 acres of alfalfa in the entire state of Kansas. But just after the turn of the century, the growing of alfalfa expanded rapidly, and by 1916 there were approximately 1,400,000 acres in the state.

Since that high in 1916, the trend of the total acres of alfalfa in Kansas has been downward, although wide fluctuations have taken place along that trend line.[1/] The extreme low of 394,000 acres occurred in 1938 at the bottom of one of the wide fluctuations.

This downward trend is due to several factors among the more important of which are: The weather, especially the series of dry years in the 1930's; the declining number of horses and mules in the state; the damage caused by insect pests; the damage caused by diseases, particularly bacterial wilt;

1/ See Fig. 5 for charted acreage from 1921 to 1946.

increased plantings of both grain and sweet sorghums; increased use of corn and sorghum ensilage for feeding to roughage-consuming livestock; the fact that early, initial plantings of alfalfa exhausted soil moisture so deeply that subsequent plantings of alfalfa failed on the same land; growing market hay became a less profitable business as the demand for Kansas grown hay lessened with the increasing acreage of alfalfa in the "dairy" states.

After the disastrous dry years of the 1930's the alfalfa acreage harvested for hay bounded back up to over 700,000 in 1942, only to be reduced again, this time by the farmers' combination of patriotism and profit by growing other crops during the emergency of the war years.

At present, the downward trend of alfalfa acreage in Kansas seems to be halted, and a moderate recovery is probable in the near future. Production Adjustment Studies made by the Bureau of Agricultural Economics, U. S. Dept. of Agriculture, and the Kansas Agricultural Experiment Station indicate that a relatively stable acreage of alfalfa near the 860,000 acre level is desirable to balance the agriculture of the state.[1/]

In contrast to the downward trend in total acres of alfalfa, the acreage harvested for seed has tended to increase rather steadily from 1921 to 1946.[2/] A large factor in this has been the constant heavy demand for Kansas grown alfalfa seed from the eastern market. The all-time high was set in 1946 when 258,000 acres were cut for seed. Figure 5 shows graphically the trend in the absolute acreage of alfalfa cut for hay and for seed in the years from 1921

1/. Dept. of Agr. Econ., Kansas Agr. Expt. Sta. and B.A.E., U. S. Dept. of Agr. A postwar pattern of production for Kansas agriculture. Agricultural Economics Report No. 25, December, 1944.

2/. See Fig. 5 for acres of alfalfa seed harvested, 1921 to 1946.

through 1946.

SEED PRODUCTION LOCALITIES

Production of alfalfa seed in the United States averaged over one million bushels per year in the 10-year period of 1936-1945, inclusive.[1/] It is a rather unique situation in that the geographical areas having the largest acreage of alfalfa are not the areas which produce the most seed. (Figs. 1 and 2) This is due to the particular characteristics of the alfalfa plant in that it usually does not set seed well under humid atmospheric conditions. Such conditions tend to prevail during the growing season in the Lake states, the area having the largest total acreage of alfalfa.

Figure 2 shows that seed production takes place largely in the Great Plains and the irrigated areas of the West. These areas have relatively arid atmospheric conditions which are considered to be favorable for, if not necessary for good seed production.

Kansas normally produces more alfalfa seed than any other state. Its neighboring state, Oklahoma, is Kansas' closest rival. These states have essentially the same type of growing-season weather. Figures in Table 1 indicate that Kansas has averaged about 13 percent of the total seed produced in the 10-year period, 1936-1945, while Oklahoma produced about 12 percent. Kansas and three neighboring states, Oklahoma, Colorado, and Nebraska, taken as a group, produced more than 36 percent of the total seed produced in the U. S. each

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1/. U. S. Dept. of Agr. Agricultural Statistics. Washington: Government Printing Office, 1938-1946. Figures taken from this source average 1,135,500 bushels yearly in the United States during the 10 years 1936 to 1945, inclusive. The 1945 figure used is "preliminary."

Table 1. Bushels of alfalfa seed produced in the 10 leading states, 1936-1945

State	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945 1/	10-year average
Kansas	56,000	73,000	118,000	161,000	154,000	150,000	156,000	238,000	155,000	220,000	148,810
Oklahoma	47,500	91,000	136,000	169,000	157,000	119,000	133,000	184,000	168,000	175,000	138,150
Arizona	80,000	130,000	107,000	140,000	103,000	85,000	135,000	99,000	77,000	73,000	102,900
Nebraska	90,000	60,000	92,000	82,000	78,000	91,000	94,000	131,000	64,000	121,000	90,300
Montana	10,000	19,200	42,000	104,000	185,000	117,000	90,000	97,000	84,000	88,000	83,620
Minnesota	103,500	93,800	57,000	137,000	168,000	58,000	22,000	59,000	42,000	43,000	78,330
Utah	52,800	64,400	105,000	103,000	92,000	45,000	40,000	48,000	42,000	33,000	62,520
California	42,000	52,800	60,000	79,000	88,000	42,000	60,000	49,000	66,000	60,000	59,880
Michigan	87,000	51,600	48,000	104,000	61,000	71,000	28,800	16,200	100,000	13,600	58,120
Idaho	42,000	84,000	64,000	76,000	80,000	44,000	36,000	59,000	52,000	38,000	57,500
Other States	277,000	261,200	203,000	333,200	323,900	227,300	172,100	189,200	292,500	281,400	255,370
United States	857,800	961,000	1,034,000	1,488,200	1,489,900	1,049,300	966,900	1,169,400	1,142,500	1,146,000	1,135,500

1/ Preliminary.

Source of Data: U. S. Department of Agriculture, Bureau of Agricultural Economics; Agricultural Statistics. 1938-1946.

year.[1/]

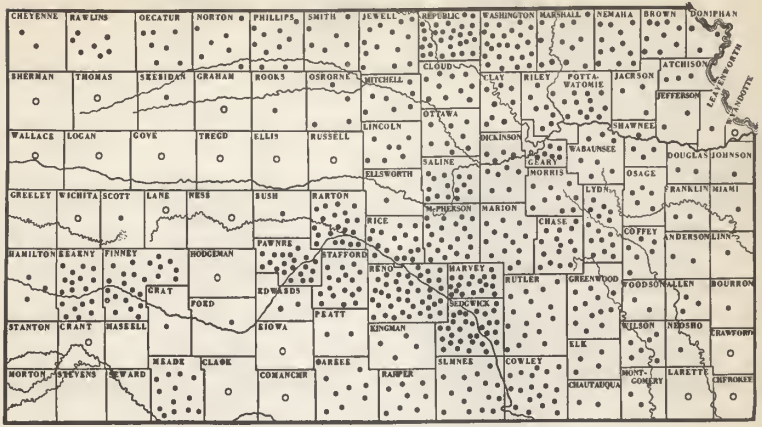
Seed production areas within the state of Kansas are the Arkansas valley, the western Flint Hills and the area that borders them on the west, and north central Kansas. The dot chart, Fig. 3, shows which counties have been important producers in recent years. For more exacting emphasis on the leading counties, Table 2 is presented. This table ranks the counties in order of their importance. Reno was the largest producer, especially so in 1946 when her county total of 35,340 bushels was more than 7,000 bushels greater than that of her closest competitor, which happened to be Republic county in that particular year, and more than twice the amount of the third ranking county in 1946. Sedgwick county holds second place over the 10-year period, 1937-46.

When counties are combined into very useful and predetermined type-of-farming areas, Fig. 4, it is type-of-farming area 6B which has produced the most seed. This was done by virtue of its having 4 (Reno, Sedgwick, McPherson, and Harvey) of its 8 counties among the 10 leading counties of the state. Area 5, the Flint Hills or Bluestem area, has been second in production. Table 3 gives the rank, production, and 10-year average production of the 5 leading type-of-farming areas.

Graphic presentation of acres of alfalfa cut for hay, acres cut for seed, and seed production for each of the 3 leading type-of-farming areas is given in Figs. 6 and 7. Absolute acreage and production figures are plotted in Fig. 6; whereas relative positions of each are plotted in Fig. 7.

1/ U. S. Dept. of Agr. Agricultural Statistics. Washington: Government Printing Office, 1938-1946. 1936 to 1945 10-year average annual production figures indicate: Kansas, 148,000 bushels, 13.1 percent of the total U. S. production; Nebraska, 90,000 bu., 8 percent; Colorado, 34,500 bu., 3 percent; Oklahoma, 138,000 bu., 12.1 percent. Included are preliminary figures for 1945. The figures for several other states are given in Table 1.

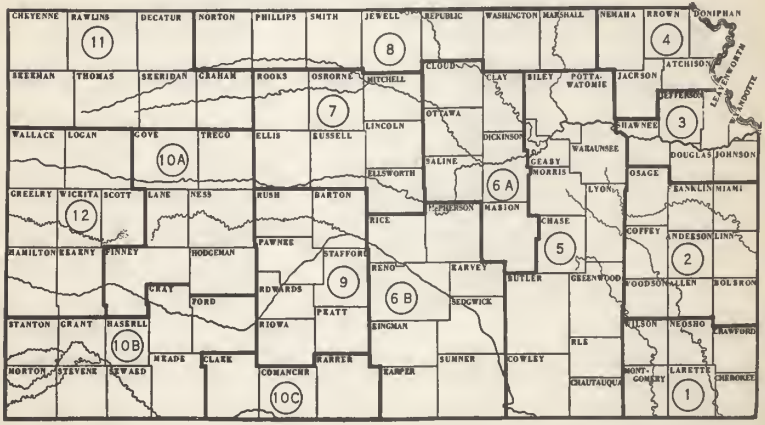
AVERAGE ANNUAL ALFALFA SEED PRODUCTION IN KANSAS, 1937-46



•=250 bushels o=Less than 125 bushels

U. S. DEPARTMENT OF AGRICULTURE FIGURE 3 NEG. 46885 BUREAU OF AGRICULTURAL ECONOMICS

TYPE-OF-FARMING AREAS IN KANSAS



U. S. DEPARTMENT OF AGRICULTURE FIGURE 4 NEG. 46888 BUREAU OF AGRICULTURAL ECONOMICS

Table 2. Bushels of alfalfa seed produced in the 10 leading counties of Kansas, 1937-1946.

County	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	10-year average
Reno	4,284	6,805	8,690	10,610	8,390	9,160	11,080	7,960	8,600	35,340	11,092
Sedgwick	3,211	7,395	12,255	11,800	7,880	7,500	5,480	4,380	4,020	12,660	7,658
Republic	663	695	935	950	1,080	4,120	12,860	8,840	12,680	27,800	7,062
Finney	4,800	6,760	2,390	2,445	2,540	2,400	15,950	4,560	8,130	10,450	6,042
Washington	329	335	1,240	1,450	2,570	9,960	8,220	11,190	7,780	16,540	5,961
Barton	1,068	2,270	2,310	2,100	2,300	7,300	10,870	4,400	6,820	12,100	5,154
McPherson	936	1,365	3,185	3,190	2,820	4,920	5,450	6,400	7,090	14,900	5,026
Pawnee	1,476	2,905	2,280	2,700	2,480	3,360	11,260	5,580	8,070	9,760	4,987
Harvey	1,164	2,000	6,465	6,780	4,870	4,910	3,820	2,920	3,870	8,610	4,541
Gowley	1,424	2,200	6,735	5,810	4,830	1,530	4,500	5,640	3,940	8,540	4,515
Other counties	41,645	58,270	114,515	106,165	98,240	78,840	148,510	106,130	125,000	230,300	110,762
State	61,000	91,000	161,000	154,000	138,000	134,000	238,000	168,000	196,000	387,000	172,800

Source of data: Kansas State Board of Agriculture, Biennial Reports.

Table 3. Bushels of alfalfa seed produced in the 5 leading type-of-farming areas of Kansas, 1937-1946

Type-of-farming area	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	10-year average
6B	12,263	23,220	40,490	42,830	32,370	38,880	36,690	32,830	34,560	97,560	39,169
5	13,999	25,545	43,580	39,380	34,400	14,600	35,520	30,460	21,830	55,380	31,469
8	2,572	3,540	6,995	7,555	10,150	22,350	40,480	31,090	47,410	82,590	25,473
6A	4,651	6,220	9,440	10,570	10,490	17,050	22,120	19,670	20,740	37,500	15,845
9	3,018	6,080	6,530	7,110	7,170	14,330	33,580	16,290	22,730	37,990	15,482
Other areas	24,497	26,395	53,965	46,555	43,420	26,790	69,610	37,660	48,730	75,980	45,362
State	61,000	91,000	161,000	154,000	138,000	134,000	238,000	168,000	196,000	387,000	172,800

Source of data: Kansas State Board of Agriculture, Biennial Reports.

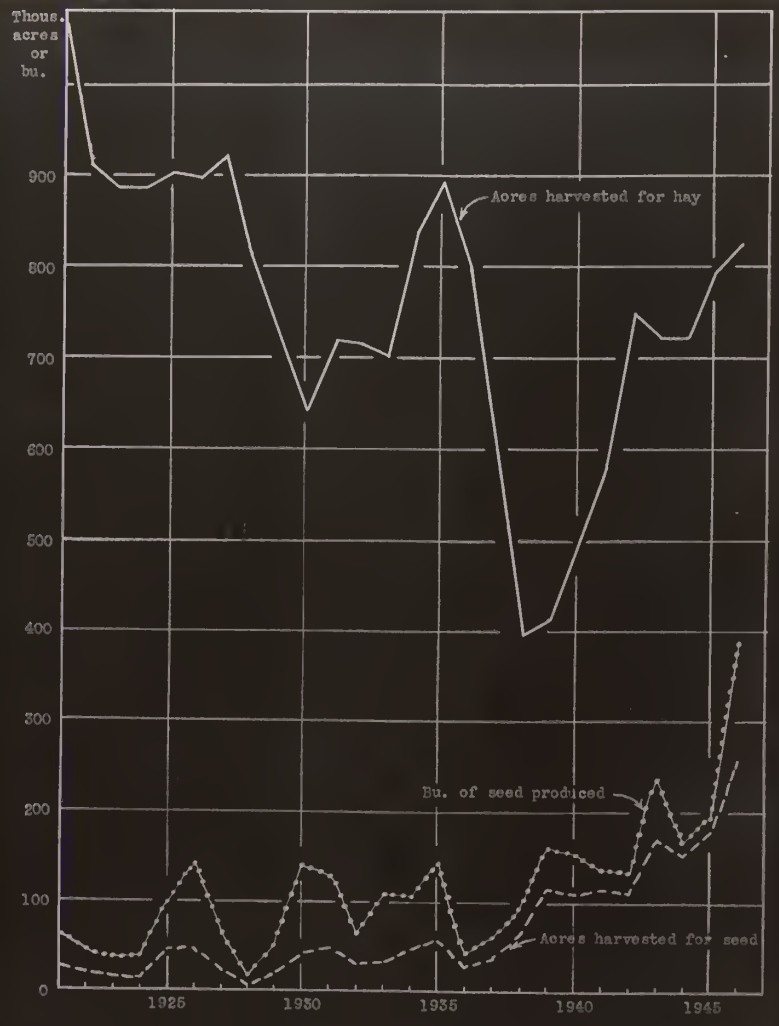


Figure 5. Acres of alfalfa harvested for hay, acres harvested for seed, and bushels of seed produced in Kansas, 1921-1946.

RELATIVE CHANGES IN ACRES OF ALFALFA HARVESTED FOR HAY, ACRES HARVESTED FOR SEED, AND BUSHELS OF SEED PRODUCED IN THE STATE AND IN SPECIFIED TYPE-OF-FARMING AREAS, 1921-46

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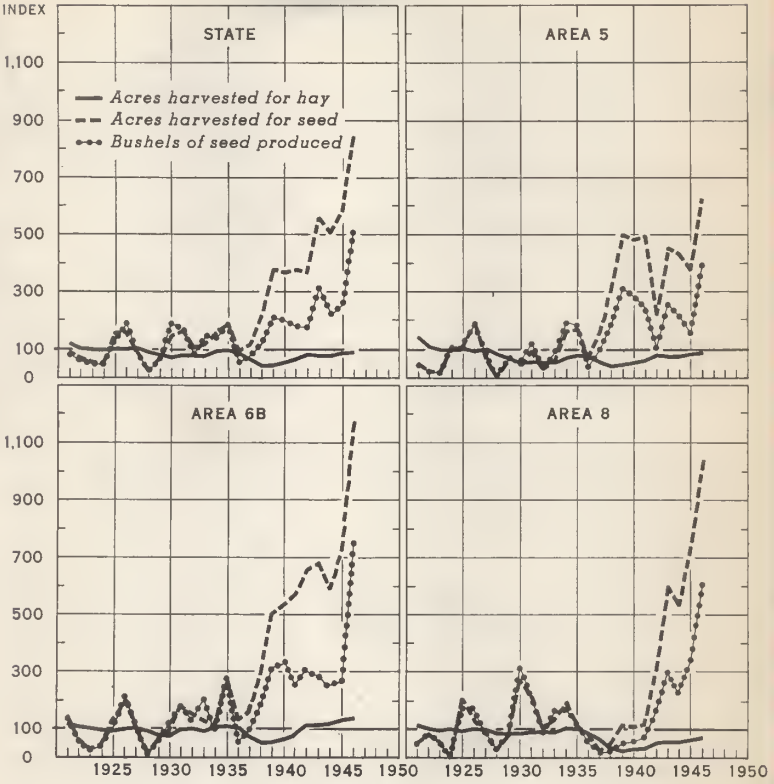

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FIGURE 7

NEG. 46884 BUREAU OF AGRICULTURAL ECONOMICS

HAZARDS OF PRODUCING ALFALFA SEED

In the process of studying an agricultural industry, such as that of producing alfalfa seed, it is well to consider some of the outstanding factors which have it in their power to spell success or failure of the industry. The hazards are classified as natural, those imposed by nature, and economic, those which to a great degree are imbedded in human nature.

It must be borne in mind that the natural-climatic hazards can be affected only slightly by man's action, but natural-biologic hazards can be circumvented frequently by man, this circumvention usually involving science and technology. And as a whole, economic hazards are more amenable than are natural hazards due to the fact that they had their origin in man's doings.

Natural Hazards

Yields of alfalfa seed are notoriously variable between fields, between localities, and between years. This extreme variation makes alfalfa seed a hazardous crop to produce. Most of the variations in yields can be attributed to one of, or a combination of, the following natural hazards to which the seed crop is very sensitive.

Climatic Hazards. Too much rainfall will cause the alfalfa plants to grow luxuriantly and will reduce the fruiting tendencies. It is believed that an amount of rainfall just shy of the wants of the plants stimulates the fruiting tendencies to highest degree. Too little rainfall results in drouth, which condition prevents plants from carrying on their normal physiological functions of plant growth and seed development. Of course, in growing seed under Kansas' meteorological conditions, drought is much more of a threat than is too much rainfall.

Timeliness of rainfall is also important to the alfalfa seed crop. The yearly rainfall could well be quantitatively sufficient to produce a good seed crop, but if rainy weather should strike just before the blooming period, it would stimulate the plants to heavy vegetative growth and poor blooming. If rainy weather should come when the alfalfa is in the bloom stage, it would reduce the insect activity in tripping and pollinating blooms, and a poor "set" of seed would result. And finally, if rainy weather should come at harvest time, much of the seed crop could be lost through shattering and/or sprouting of the seeds.

There is real danger in wind. If strong winds should come at harvest time, when seed hay is cut and in windrows, swaths, or bunches, seed hay would be scattered about and seed lost. The rate of movement of air is an important factor in determining the rate of evaporation. Excessive evaporation may reduce soil moisture to such an extent as to inhibit plant development and cause serious crop failure. Thus wind becomes a factor in drought.

Alfalfa is able to withstand high temperatures if it has enough soil moisture to draw upon and if the humidity is low. High temperature is also a factor in evaporation and, therefore, in drouth. Low temperatures in winter may cause winterkilling which means a poor crop the following season. For most other crops the hazard of low temperature is manifest in frost damage. The alfalfa seed crop is relatively free from the possibility of frost damage as the crop comes in the center of the growing season with a cutting of hay normally coming both before and after.

In Kansas, hail is more of a threat to growing crops than it is in many other areas which produce alfalfa seed. A severe hail storm can destroy a crop in any stage of growth. Floods, also, are possible destroyers of seed

crops. Lightning could destroy part or all of a seed crop depending upon where and when it should happen to strike.

Biological Hazards. The most serious disease which attacks alfalfa is bacterial wilt (Corynebacterium insidiosum). This disease takes a heavy toll in some fields as diseased plants are unthrifty and cannot produce a heavy, paying crop of seed. Fortunately, this disease has forced plant breeders to develop wilt resistant varieties. Whereas there would be little demand for (therefore purpose in growing) seed from diseased plants, there is great demand for seed of the disease resistant varieties. Other diseases of alfalfa are Black-stem, Yellow Leaf Blotch, Violet Root-rot, and Rust.

An adequate supply of certain insects must be present to perform tripping and pollinating operations on alfalfa plants' blooms in order that a high percent of blooms develop into seed pods.

Grasshoppers are the No. 1 insect menace to alfalfa seed crops, as well as to hay crops, in Kansas. Other insects which feed upon alfalfa plants are lygus bugs, species of cutworms and armyworms, corn earworms, pea aphids, common webworms, etc. An insect which confines its damaging work on alfalfa to crops grown for seed is the clover seed chalcid. This insect inserts her eggs into the growing seed and the larvae subsequently hatched eat the contents of seeds, leaving empty shells.

Noxious weeds are a hazard to alfalfa seed production not only because of the weeds' growing in alfalfa fields rob the alfalfa of moisture and food or are actually parasitic on alfalfa, as is the case with dodder, but the presence of noxious weed seeds in alfalfa seed causes severe dockage in the selling price of that alfalfa seed. The more important noxious weeds in Kansas are: dodder, foxtail, cheat, crabgrass, pigweed, and species of dock.

Economic Hazards

Labor Hazard. Even though the man-labor required to harvest a crop of seed has been decreasing in the past years, a certain amount of the right kind of labor must be spent to harvest the crop. If this labor is not available, the crop is not harvested.

It is essential to have sufficient labor available when the crop is ready to harvest if its full value is to be obtained. This timeliness of labor is extremely important.

Price Hazard. In addition to the normal economic demand and supply situation, for this particular crop price relationships existing between two alternate products, seed and hay, must be considered. If this relation is such that it will take an exceptionally heavy crop of seed to equal the value of the amount of hay which the seed crop would prevent from being harvested, then it is economically hazardous to grow and to harvest the seed crop.

The demand for Kansas grown alfalfa seed is strong. Kansas grown seed is adapted and recommended for planting in wide areas where seed is not produced in large enough quantities to satisfy local demand. Especially strong is the demand for seed of the Buffalo variety at this time. The demand so far exceeds the supply at present that extremely high prices for that variety predominate. Should the supply catch up with the demand, however, the resulting drop in prices might make producing Buffalo seed hazardous.

OBJECTIVES OF STUDY

The foregoing material has established the importance of alfalfa seed crops of Kansas, and has given the more recent history of alfalfa seed production in the state. With that solid base presented, the objectives of this

study can be founded, appreciated, and precisely set forth. The primary objectives are:

1. To determine the more important motivating forces back of the farmers' decisions to leave cuttings of alfalfa for seed rather than to cut them for hay.

2. To determine and describe prevailing methods of harvesting alfalfa seed in Kansas.

3. To determine labor requirements for harvesting alfalfa seed.

4. To determine cost of harvesting alfalfa seed.

5. To determine management income from the alfalfa seed crop.

NEED FOR STUDY

Heretofore there have been made no studies on the economic aspects of the Kansas alfalfa seed crop; there is no factual information on the points listed in the above section as "Objectives" of this economic study. This pioneering manifestation has made the study particularly attractive. And because of the record-breaking crop of 1946, alfalfa seed apparently had assumed a place of greater importance in the minds of agriculture-connected persons than it had at any previous time.

SAMPLING PROCEDURE OF STUDY

Due to the limitations imposed by lack of time, facilities, and available finances, it was decided to use the mailed-questionnaire method of gathering data.

Peculiar characteristics which accompany the growing of an alfalfa seed crop in any given year made strictly random sampling of farms impractical, if not impossible. There is no assurance that farms which produce alfalfa seed

one year will produce it the next year nor are they any more likely to have produced seed the previous year. For this reason, a policy of "take the farms where you can get them" was followed to obtain a sample of sufficient size to warrent the study.

The principal source of names for the questionnaire mailing list was correspondence with agricultural agents in counties which normally reported some seed production. Ninety-two county agricultural agents were written to, and it is interesting to note that 70 (76 percent) of those written to replied by giving names of growers in their respective counties.

Additional names were obtained from the Kansas State College office of the Kansas Crop Improvement Association, and from account books of Farm Management Association members. Names obtained from the Kansas Crop Improvement Association are names of growers of certified or eligible-for-certification seed.

A total of 935 questionnaires were mailed out. Two hundred ninety nine of those returned contained useable information. It is on those 299 useable questionnaires that this study has been based.

DESCRIPTION OF FARMS IN STUDY

The farms in this study are from all parts of the state of Kansas; however, there are more from the heavy seed producing regions than from other areas. Table 4 gives the number of farms in each type-of-farming area.

It was possible to determine on each of 287 farms the total farm acres, acres of alfalfa one year old or older, and acres of alfalfa cut for seed. The results, which are shown in Table 5, indicate that the average size farm in the study was 619 acres, the average amount of alfalfa one year old or older was 39.4 acres, and 32.3 acres was cut for seed.

Table 4. Total number of farms in study distributed by type-of-farming area.

Type-of-farming area	Number of farms reporting
1	4
2	16
3	13
4	18
5	47
6A	26
6B	29
7	9
8	27
9	26
10A	7
10B	9
10C	15
11	12
12	11
Total	299

Table 5. Description of farms in study by type-of-farming area

Type-of-farming area	No. farms for which acreages in columns 3, 4, & 5 were given	Average size of farms, in acres	Average number acres alfalfa, one year or older per farm	Average number acres harvested for seed per farm
1	4	480	10.8	9.5
2	16	552	35.5	25.8
3	12	634	23.1	15.9
4	17	303	21.8	12.3
5	46	753	34.0	29.2
6A	25	435	32.2	27.1
6B	57	455	48.0	35.6
7	9	737	26.5	22.1
8	26	406	38.3	30.1
9	25	749	42.3	39.3
10A	7	640	60.4	60.0
10B	9	838	71.9	66.9
10C	14	1,048	31.9	26.6
11	11	1,183	50.8	36.7
12	11	637	50.6	50.1
Total	287	619	39.4	32.3

As will be brought out in a later section, the acreage harvested for seed, along with its associated production, could be calculated for 292 farms. The average number of acres harvested for seed on those farms was 31.6. Since this figure represents a greater number of farms than the figure in the preceding paragraph, it is considered to be the more representative, and hence is used as the average for the study.

WHY ALFALFA WAS LEFT FOR SEED, 1946

In each growing season a farm operator who has alfalfa growing on his farm is faced with the necessity of making a decision as to whether he shall cut the alfalfa for hay or leave it stand to mature a seed crop. The critical time for this decision is, theoretically, when the alfalfa crop nears full bloom. If it is to be cut for hay, it will have to be cut at about that time or the quality of the hay will be progressively lessened as the cutting is delayed.

It was learned from this study just what factors influenced farm operators to leave alfalfa for seed in 1946. A list of possible reasons why an alfalfa grower might let a crop go to seed was given on the questionnaire. The farm operator was asked to indicate which of these reasons was his "outstanding" reason and also to indicate, in order of their importance, his other reasons for producing a seed crop. The results of this question are given in Table 6.

Rank and Description of Reasons

Analyses of returns on this question show that the most important factor in causing the enormous acreage of alfalfa to be left for seed and harvested in 1946 was the high price for which the seed could be sold. A more detailed discussion of seed prices will be given in a following section; let it suffice

for now to say that the average price of alfalfa seed for the state as a whole was close to $21.00 per bushel, or 35 cents per pound.

Second in rank was that producing alfalfa seed was a regular, yearly practice.

Third ranking reason was that there were particularly favorable weather conditions for producing the seed. Favorable conditions are considered to be a somewhat limited amount of soil moisture available, and bright, sunny days, particularly at blooming time, to encourage the activity of insects which pollinate and fertilize the blooms.

The reason ranking fourth was that good bloom development made a good seed crop look probable. Chances for a good seed crop are much greater from a field of plants which bloomed plentifully than they are from one scantily bloomed.

Above are the four most popular reasons why operators of farms in this study let crops of alfalfa go to seed. Other reasons in order of their rank are:

Needed seed to plant.

Had poor hay crop prospects for the next cutting. The weather has a great effect on this reason. Here it was intended that the primary interest of the farm operator be in a hay crop, and he saved a seed crop as a substitute. Actually the prevailing circumstances were that the hay crops were too short and too thin to pay for their own harvest.

Shortage of labor to handle the hay crop. In many instances the second cutting of alfalfa hay was ready at wheat harvest time. The hay crop was then left for seed rather than to interrupt the wheat harvest. Labor conflicts of this kind were most serious in type-of-farming areas 6B and 9. Also coming under this heading were cases where custom haymaking operations

Table 8. The list of reasons why an alfalfa grower might let a crop of alfalfa go to seed as it appeared on the questionnaire.

Code letter	Reason
A	Regular, yearly practice on the farm.
B	Had particularly favorable weather conditions to produce seed crop.
C	The high price which seed would sell for.
D	Already had harvested enough hay to carry livestock through winter.
E	Had poor hay crop prospects for the next cutting.
F	Needed some seed to plant.
G	The alfalfa field is at a distance from barnyard and feedlots so that a seed crop was preferred to hauling hay the long distance.
H	Needed cash for financial reasons.
I	Growing a certain variety of alfalfa, the seed of which is in particularly great demand.
J	Good bloom development made a good seed crop look probable.
K	Shortage of labor to handle hay crop.
L	Others.

Table 7. Reasons for leaving seed crop ranked for each of the five most important seed-producing type-of-farming areas and for the study as a whole. Reasons represented by code letters.

Rank	Type-of-farming area							Composite
	5	6A	6B	8	9	All others		
1	B	B	A	C	A	C		C
2	C	C	C	J	C	B		A
3	J	A	B	A	J	J		B
4	E	J	E	B	B	A		J
5	A	D	J	E	K	F		F
6	F	K	K	D	I	K		E
7	D	E	D	F	D	D		K
8	K	F	F	K	E	E		D
9	I	H	I	-	F	H		H
10	H	G	H	-	H	I		I

could not be hired when needed.

The farm operator had already harvested enough alfalfa hay to carry his livestock through the winter. Another hay crop would have been "excess baggage," whereas letting the cutting go to seed made a cash crop.

Needed cash for financial reasons. This reason suggested the possibility that the farm operator had an outstanding debt that was due and he resorted to a cash crop of alfalfa seed in order to pay the debt.

Growing a certain variety of alfalfa the seed of which is in particularly great demand. This reason was pointed at the growers of Buffalo alfalfa. This new, disease-resistant variety has enjoyed sensational popularity the past few years, and the seed is saleable at such extraordinary high prices that most farm operators who had this variety growing on their farms found it profitable to harvest a seed crop. This reason ranked tenth in the over-all list only because there were comparatively few farm operators growing Buffalo. On those farms which did grow Buffalo, this was the first and foremost reason for harvesting seed. On an occasional farm which grew certified seed of either the Ladak or Grimm varieties this reason was placed first.

In the lines left blank for the farm operator to write in his own particular reason, in case it wasn't covered in the reasons listed, some interesting things came to light. One farm operator left his crop for seed because he had no place to barn the hay which he would have cut. Two farm operators stated that they liked to leave alfalfa for seed because they believed it made the stand last longer. Another man stated that alfalfa seed sold as a cash crop did not remove as much fertility from his farm as a crop sold for hay would remove. One farmer took an especial interest in insects and stated that there had to be a large enough insect population to cross pollinate the blooms

before he would leave a seed crop. Another man had a seed crop on his farm simply because he wanted to leave alfalfa stand for grasshoppers to feast upon rather than have them migrate to his corn as would have happened had he cut the alfalfa for hay.

Method of Numerical Evaluation for Ranking Reasons

Farm operators usually used the suggested way of ranking the reasons listed on the questionnaire. That is, they indicated rank by using 1, 2, 3, etc. Where this was done the ranked reasons were given the following point values:

No. 1 reason given value of 10 points.
" 2 " " " " 8 " .
" 3 " " " " 6 " .
" 4 " " " " 5 " .
" 5 " " " " 4 " .
" 6 " " " " 3 " .
" 7 " " " " 2 " .
" 8 " " " " 1 point.
" 9 and up, not evaluated.

However, some farm operators did not rank the reasons, but indicated by checking one or more that those checked were the reasons they considered. Where reasons were so checked by a farm operator, but not ranked as 1st, 2nd, 3rd, etc. by him, each checked reason on that questionnaire was given equal weight according to the following schedule:

Where 2 checked given valuation of 9 points each.
" 3 " " " " 8 " " .
" 4 " " " " 7 " " .
" 5 " " " " 6 " " .
" 6 " " " " 5 " " .
" 7 " " " " 4 " " .

The above scale was determined on this basis: If 3 reasons were indicated and ranked as 1st, 2nd, and 3rd, then that questionnaire would have a total valuation of 10 plus 8 plus 6 points equal to 24; if 3 reasons were

indicated, but not ranked on a questionnaire, that questionnaire would still have a total valuation of 24 points; however, since there was no distinction made among the indicated reasons, each assumed equal weight or 8 points each.

PRODUCTION PRACTICES

The 299 farms in this study were represented by 453 fields of alfalfa. All of these fields were cut for hay, and 408 (90 percent) of them were cut for seed, at some time during the season. Table 8 gives a complete summarization of the number cut for hay or for seed at each cutting. Outstanding observations of this table are that on these seed-producing farms almost 100 percent of the fields were cut for hay at the first cutting; more fields were cut for seed than were cut for hay at the second cutting; more were cut for hay than for seed at the third cutting; few fields were cut for the fourth time, but of those which were the larger number was cut for hay.

The main crop of seed, then, came from the second cutting of alfalfa.

TIME REQUIRED TO MATURE SEED CROP

When the second cutting of alfalfa was saved for seed, an average of 83 days elapsed between cutting the first crop for hay and cutting the second crop for seed in 1946. From data collected in Section III of the questionnaire it was determined that the average date of first cutting of alfalfa was May 24, and the average date for harvesting second cutting seed crop from those fields was August 15. The interval between those dates is 83 days. Table 9 shows the variation in average dates and maturing periods by type-of-farming area.

Progressively shorter maturing periods were necessary when third and fourth cuttings were left for seed. The maturing periods by type-of-farming

Table 8. Number of alfalfa fields cut for hay or seed by type-of-farming area.

Type-of-farming area	Total number of fields for which cuttings could be determined	1st cutting		2nd cutting		3rd cutting		4th cutting	
		Hay	Seed	Hay	Seed	Hay	Seed	Hay	Seed
1	4	4	-	2	2	1	2	-	-
2	26	25	1	15	11	13	6	4	2
3	20	20	-	7	13	9	5	3	1
4	33	32	1	11	18	11	11	-	1
5	73 1/	73	-	34	38	35	16	8	9
6A	33	33	-	15	17	12	9	1	2
6B	83	81 2/	-	41	42	41	25	12	4
7	8	8	-	7	1	-	7	-	-
8	45	44	1	22	23	15	14	3	1
9	40	40	-	12	28	21	14	1	-
10A	14	13	1	3	11	9	1	-	-
10B	16	16	-	1	15	4	1	-	-
10C	26	26	-	18	8	9	14	2	1
11	13	13	-	3	10	3	2	1	1
12	19	18	1	9	10	5	8	-	-
Total	453	446 2/	5	200	247	188	135	35	22

1/. One field reported 5 cuttings of hay.

2/. Two fields pastured-off.

Table 9. Days to mature alfalfa seed crop when first cutting cut for hay and second cutting cut for seed, 1946.

Type-of-farming area	No. of fields used in calculating	Average date 1st cutting cut for hay	Average no. days elapsed before 2nd cutting cut for seed	Average date 2nd cutting cut for seed
1	1	May 20	87	Aug. 15
2	5	May 26	81	Aug. 15
3	5	May 17	88	Aug. 13
4	8	May 27	79	Aug. 14
5	18	May 24	75	Aug. 7
6A	8	May 30	76	Aug. 14
6B	31	May 16	83	Aug. 7
7	1	June 1	83	Aug. 23
8	12	May 31	88	Aug. 27
9	19	May 26	78	Aug. 12
10A	7	May 26	83	Aug. 17
10B	13	May 30	87	Aug. 25
10C	6	May 11	82	Aug. 1
11	9	June 5	106	Sept. 19
12	7	June 12	81	Sept. 1
Total	150	May 24	83	Aug. 15

area for these cuttings are shown in Table 10. Due to the extreme irregularity of times of cutting, it was impractical to calculate average dates of cutting second and third cuttings for hay and for the respective following seed crops.

CALCULATING AVERAGE DATES

The method used in calculating average dates for this section was to assign each date a numerical value which corresponds to its relative position in the 365 days of the year, add together these numerical values, and calculate a simple arithmetic average from the sum obtained.

For example:

July 4th is the 185th day of the year.
July 6th is the 187th day of the year.
July 8th is the 189th day of the year.

These values added-- 561

Five hundred sixty one divided by 3 (number of days being averaged) gives a quotient of 187, which is the 187th day of the year. Reconverted to a date, 187 becomes July 6th which is the average date of those listed.

YIELD OF SEED

In general, 1946 was one of the best years for high yields that alfalfa seed producers have ever experienced, but there were a few crop failures. A Marion county farm operator wrote on his questionnaire: "We have had alfalfa on this farm since 1892 and this year is the only one like this . . . My father planted 12 acres of alfalfa in 1892. We have had some acreage ever since, but never a crop that was the equal of this one." The yield on that farm was 3 bushels of clean seed per acre. A Barton county farm operator

Table 10. Days to mature alfalfa seed crop, 1946.

1st and 2nd cuttings cut for hay and 3rd cutting cut for seed			1st, 2nd, and 3rd cuttings cut for hay and 4th cutting cut for seed		
Type-of-farming area	Number of fields used in calculating	Average no. days elapsed between date 2nd cutting for hay and 3rd cutting for seed	Type-of-farming area	Number of fields used in calculating	Average no. days elapsed between date 3rd cutting for hay and 4th cutting for seed
2	5	67	4	1	88
3	3	75	5	6	64
4	4	94	6A	2	75
5	8	74	6B	3	75
6A	5	99	10C	1	67
6B	16	70			
7	4	65			
8	5	80			
9	7	79			
10C	11	71			
11	2	84			
Total	70	76	Total	13	70

wrote: ". . . The 1946 crop was the best I have ever had . . ."

The highest yield reported on any one farm was 7.8 bushels per acre on a Hamilton county farm. A Reno county farm operator wrote: "I used my combine to thresh alfalfa for neighbors, . . . Threshed some seed on bottom land that ran as high as 7 bushels per acre, clean seed, in third cutting crop."

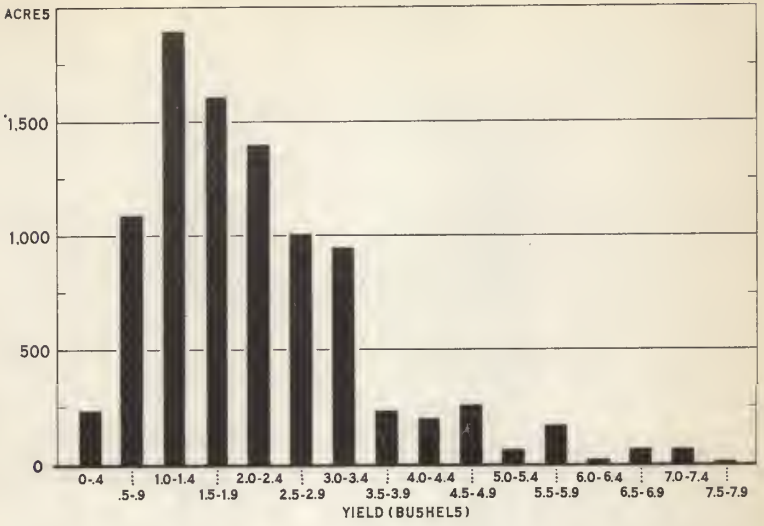
In this study there were 9,231 acres for which production could be determined; there were 19,060 bushels of seed harvested from those acres, giving an average yield of 2.06 bushels (2.1 rounded figure) per acre. Figure 9 shows the frequency distribution of 292 farms classified according to yield, and Fig. 8 shows the frequency distribution of 9,231 harvested acres classified according to yield. The class interval for each of these charts is ½ bushel. The charts are related to each other in that the acres shown on one chart were found on the farms of the other chart.

It is worthy of note that in spite of such pertinent statistics of this group of data as the median, mode, and weighted arithmetic average yield being located in the 2.0--2.4 bushel class, the greatest number of farms, as well as the greatest number of acres, is found in the 1.0--1.4 bushel class. This, of course, is due to the skewness of the distribution in that a few acres and a few farms are found in the high-yield classes.

Yield by Type-of-Farming Area

Table 11 gives the average per acre yields only in those type-of-farming areas for which the yield on more than 300 acres could be established from this study. The state total includes also those type-of-farming areas for which a yield on less than 300 acres could be determined. The yield was calculated for each type-of-farming area by totaling the acres for which a

DISTRIBUTION OF 9,231 ACRES OF ALFALFA HARVESTED FOR SEED CLASSIFIED ACCORDING TO YIELD, 1946



U. S. DEPARTMENT OF AGRICULTURE

FIGURE 8

NEG. 46887 BUREAU OF AGRICULTURAL ECONOMICS

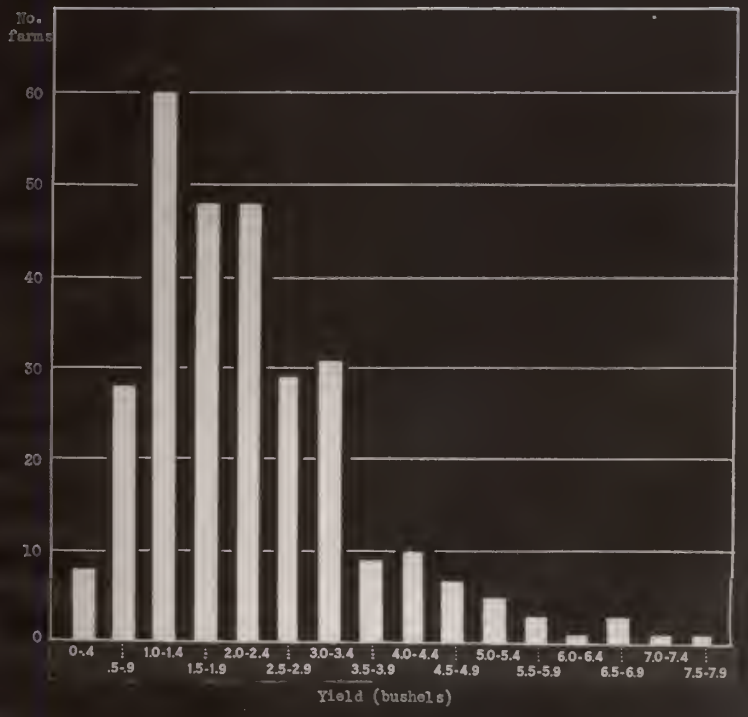


Figure 9. Distribution of 292 Kansas farms classified according to yield of alfalfa seed, 1946.

Table 11. Yield of seed as reported in study by specified type-of-farming areas, 1946.

Rank	Type-of-farming area	No. acres harvested for seed	Average per acre yield
			(Bu.)
1	10B	802	2.81
2	10A	420	2.69
3	10C	372	2.49
4	12	551	2.31
5	9	1,048	2.26
6	11	404	2.19
7	2	412	1.96
8	8	782	1.95
9	5	1,536	1.93
10	6B	2,044	1.81
11	6A	618	1.61
	All others	642	1.90
	Total	9,231	2.06

production was given and then dividing this acreage into the total production from those specific acres.

Irrigation was an important factor in making the average yields of type-of-farming areas 10B and 10A higher than the other areas. By irrigating, the water supply of the plants could be regulated to the extent of approaching the ecological optimum in conditions for seed production. Hence, high yields on many irrigated fields, although irrigation in itself did not assure high yields. Some irrigated fields had yields much lower than a great number of non-irrigated fields.

Yield by Cuttings

There was little difference evident in the yields of the various cuttings for seed. For the study as a whole, the difference in yield between the 2nd and 3rd cuttings, the two major seed cuttings, was less than one-tenth of one bushel per acre. Table 12 gives a complete summarization of yield by cuttings on those acreages for which cuttings and yield could be determined and associated.

Procedure for Converting Uncleaned Seed to Clean Seed Basis

In the foregoing section on yields, all yield and production figures were given in terms of clean seed. On the questionnaire some of the production figures for individual farms were given in terms of "machine run" seed. Therefore they had to be reduced to a clean seed basis before they entered into yield calculations.

Section III of the questionnaire gave the farm operators opportunity to report their production on either a clean or an uncleaned basis or to give both figures. Reports for 119 individual fields, distributed throughout all

Table 12. Yield of seed, survey summarization by cuttings

Cutting	Acres harvested	Total production (bu.)	Per acre yield (bu.)
1st cutting for seed	52.5	162.30	3.09
2nd cutting for seed	5,125.9	10,829.52	2.11
3rd cutting for seed	2,841.8	5,710.97	2.02
4th cutting for seed	470.0	1,133.30	2.41
Total all cuttings	8,490.2	17,836.09	2.10

Table 13. Summary of reports which gave seed production on both clean and uncleaned basis

Method of harvesting	Number of reports	Average percent trash in uncleaned seed
Combine from standing crop	8	15.0
Pick-up combining from windrows or swaths	58	21.8
Threshing with stationary thresher	53	22.5
All methods	119	21.7

type-of-farming areas and all cuttings cut for seed gave both the uncleaned bushels and the bushels of cleaned seed. In Table 13 it was determined that uncleaned seed contained an average of 21.7 percent trash, hence 78.3 percent clean seed.

Those reports which gave their seed production only in uncleaned bushels were reduced by 22 percent (21.7 percent rounded) before being allowed to enter into the calculations to determine yield.

So far as could be determined, there was an insignificant amount of difference between the percent of trash in seed harvested by one method as compared with that harvested by another method. Theoretically there should be more trash in seed combined from the standing plants than in seed pick-up combined from windrows or swaths, and seed threshed with a stationary threshing machine should have the least. However, in the number of reports available, those differences did not exist.

METHODS OF HARVESTING ALFALFA SEED, 1946

A total of 21 separate methods of harvesting alfalfa seed were carried on by the farm operators in this study. This large number of methods used may be attributed primarily to the tendency of farm operators to use such machines and labor as were available to them.

Determination of Method of Harvesting

In Section V of the questionnaire farm operators were asked to indicate which of the farm implements listed there were used in harvesting their seed crops, or if not listed, to write-in other machinery which they used. Then by noting the implements that were used, the method of harvest could be declared. Occasional explanatory notes written on the questionnaire also

helped to determine the method of harvest in some cases.

Classification of Methods

Methods of harvesting alfalfa seed fell into three primary classifications according to procedure in threshing. These classifications are:

1. Combining from standing crop.
2. Pick-up combining from windrow or swath.
3. Operations culminating in the use of a stationary threshing machine.

Both the second and the third classes have several subdivisions, each a distinct method of harvesting. All methods are listed with their respective, abbreviated, and identifying descriptions on page 43. For sake of easier manipulation, each method was assigned a code number by which it will be identified henceforth in this write-up. A more complete description of each of several important methods is given in following paragraphs.

Rank and Description of Methods of Harvesting

By far the most important method of harvesting alfalfa seed in 1946 on the farms surveyed was to cut the crop by using a mower with a windrowing attachment, then to thresh from that windrow using a combine equipped with a pick-up attachment. This method, code No. 2A, was not only first in the composite rating for the study as a whole, but it placed first in 9 of the 15 individual type-of-farming areas. Out of the total of 309 reports on methods used, this one was used 110 times, or in 36 percent of the cases.

Those windrowing attachments used on mowers were of various types; however, the most common one was the steel-slat, curled-end type which delivered the cut material to the inside. Others were so constructed as to deliver to

Table 14. List of methods of harvesting alfalfa seed associated with their identifying codes.

Code	Method description
1	Combine from standing alfalfa.
2A	Mow, windrow attachment, pick up with combine.
2B	Mow, rake, pick up with combine from windrow.
2C	Pick up from swath with combine.
2D	Mow, rake, bunch, shock-thresh with combine.
2E	Mow and rake simultaneously, pick up with combine.
3	Bind, shock, haul to stationary thresher.
3A	Windrow with grain binder, pick up with combine.
3B	Windrow with grain binder, cock, haul to stationary thresher.
3C	Bind, haul from bundle row to thresher.
4	Mow, rake, stack, thresh from stack with stationary thresher.
5	Mow, windrow attachment, haul from windrow to stationary thresher.
5A	Mow, rake, haul from windrow to stationary thresher.
5B	Mow, bunching attachment, haul from bunches to stationary thresher.
5C	Mow, windrow attachment, bunch by hand and/or rake, haul to stationary thresher.
5D	Mow, rake, cock, haul to stationary thresher.
6	Mow, rake, buck from windrow to stationary thresher.
6A	Mow, rake, bunch, buck bunches to stationary thresher.
6B	Mow and rake simultaneously, buck windrows to stationary thresher.
6C	Mow, windrow attachment, buck from windrow to stationary thresher.
6D	Mow, windrow attachment, bunch, buck to stationary thresher.

(Field combining codes: 1, 2A, 2B, 2C, 2D, 2E, 3A)

the center, making the windrow in the middle of the swath where it was cut. In special cases where farm operators had two machines cutting at the same time, one following the other, they rigged up the windrowing attachment on one of the mowers to deliver to the inside and the other one to deliver to the outside of the swath. In this way they could throw two windrows close enough together so that the pick-up attachment on a combine could take both at the same time.

Outstanding advantages of this 2A method of harvesting were derived from the fact that seed-hay was cut and windrowed in one and the same operation. As fresh-cut, green, uncured seed-hay was put in windrows, there was a minimum of chance for seed pods and leaves to shatter. Although his first concern is to save the seed pods, a producer is also interested in saving as many leaves as possible if he intends to use the threshed straw for feed. The more leaves contained in the straw, the more valuable that straw is for feeding purposes.

Another big advantage is that this method uses less labor than many others. Labor requirements of this and other methods will be taken up in detail in a later section.

The second most-used method of harvesting was method 2B. By this method the seed-hay was cut with a mower, raked into windrows by either side-delivery or dump rakes, and later pick-up combined. This 2B method was used 28 times in the total of 309 reports.

The method that ranked a close third in number of users was that of combining directly from standing plants. This method, code No. 1, ranked first in 3 type-of-farming areas of lesser importance, areas 1, 10C, and 11. The principal advantage of this method was that it required the least amount

Table 15. Survey summary of methods of harvesting ranked according to frequency of use.

Rank	Method of harvesting	Number of reports
1	2A	110
2	2B	28
3	1	26
4	3	23
5	3A	18
6	5D	13
7	3C	13
8	2C	12
9	4	9
10	5C	9
	All others	48
	Total	309 1/

1/. This figure is larger than the total number of farms in the study due to the fact that on each of 10 farms 2 different methods were used.

Table 16. Methods of harvesting in specified type-of-farming areas ranked according to frequency of use.

Rank	Area 5		Area 6A		Area 6B		Area 8		Area 9	
	Method	Number of reports	Method	Number of reports	Method	Number of reports	Method	Number of reports	Method	Number of reports
1	2A	18	2A	11	2A	26	5D	5	2A	16
2	3	7	2B	3	3A	8	5A	4	2C	2
3	3A	5	3	3	2B	7	2A	4	1	1
4	2B	3	2E	2	3	4	2B	4	3	1
	Others	15	Others	8	Others	15	Others	12	Others	6
Total		48		27		60		30		26

Table 17. Survey summary of methods of harvesting ranked according to number of acres harvested.

Rank	Method of harvesting	Acres harvested	Percent of total
1	2A	3,781	40.7
2	1	748	8.1
3	3A	651	7.0
4	3C	537	5.8
5	2B	528	5.7
6	3	518	5.6
7	3C	479	5.2
8	4	393	4.3
9	2C	306	3.3
10	5D	278	3.0
	All others	1,085	11.5
	Total	9,281	100.0

Table 18. Survey summary of methods of harvesting ranked according to number of acres harvested in specified type-of-farming areas.

Rank	Area 5		Area 6A		Area 6B		Area 8		Area 9	
	Method	Acres	Method	Acres	Method	Acres	Method	Acres	Method	Acres
1	2A	748	2A	274	2A	846	2A	148	2A	620
2	3A	150	3	77	3A	410	3C	140	1	140
3	3	110	2B	73	3C	188	6A	133	2C	98
4	1	55	2E	39	3	120	5D	81	6C	82
	Others	328	Others	155	Others	620	Others	280	Others	138
Total		1,336		618		2,044		782		1,048

harvesting labor.

Method bearing code No. 3, the fourth ranking and only other method that was used more than 20 times in the 309 reports, was that of binding the alfalfa with a conventional small-grain binder, shocking the bundles, then, after cured, hauling-in to a stationary machine for threshing. In most cases the machine was a conventional threshing machine, but a few hullers were used.

In fifth place, according to the number of times used, was the 3A method which consisted of windrowing by use of either a small-grain binder or a "wheat header" type of implement. A pick-up combine was used for threshing. When small-grain binders were used, the operators removed the bunching and tying mechanisms and also the bundle carriers so as to let the cut material run from the machine in a continuous stream to make a solid windrow. The windrows thus deposited were usually larger than those made by windrowing attachments on mowers as the width of cut of binders and headers was commonly larger than that of mowers. Ten-foot power binders and 12-ft. headers were common sizes of those implements used.

Methods described in the following paragraphs are not necessarily taken in the order of their importance as were the methods previously described.

Method 2C, that of pick-up combining from the mower swath, has gained the favor of some producers. It is especially adapted to long seed-hay. This method cuts down the handling of a cut seed crop to a minimum, which in turn reduces the shattering of seed and pods and leaves.

Method 2E employs the pick-up combine threshing from windrows made by a rake drawn in tandem with the mower. This mowing and raking simultaneously has the labor-saving advantage of one-time-over operation and at the same time has the agronomic advantage of placing the seed-hay in windrows before it dries out and shatters seed and leaves.

Method 4 is characterized by the stacking of loose seed-hay and threshing at some future date. This is an old-fashioned method, but many producers claim that it produces the highest quality seed. Another big advantage is that the threshing of stacked seed-hay may be postponed to a slack season, or until time can be found to do it.

Methods bearing the number 5 are variations in procedure from the time seed-hay is mowed until it is hauled from the field and threshed by a stationary thresher, the hauling being done on wagons, trailers, sleds, and such implements other than buckrakes.

Methods identified by a number 6 are methods in which seed-hay was transported from field to thresher by buckrakes. Method 6 had the seed-hay bucked from conventionally raked windrows; method 6A bucked from bunches or cocks; 6B bucked from windrows made by side-delivery rakes pulled along with mowers; 6C bucked from windrows made by windrowing attachment on mower.

It is interesting to note that field combining (combining from standing plants, windrows, and swaths) was used in 67 percent of the cases for which method was determined, and also was used on 67 percent of the acreage for which method was determined.

YIELD OF ALFALFA STRAW

Alfalfa straw is a by-product of the alfalfa seed crop, but judicious saving and utilization of it adds considerably to the total value of alfalfa crops saved for seed.

Compared with a cutting of good hay, the yield of straw is low. This is true not solely because the plants produced seed, but largely because environmental conditions that promote seed production usually promote a poor vegetative growth.

The amount of straw saved was not asked for specifically on the questionnaire. However, 3 farm operators indicated on their questionnaires the amount of straw they saved. Also, special letters were written to farm operators located in widely spread parts of Kansas to obtain their estimates on the amount of alfalfa straw per acre that they were able to save after threshing seed. A summarization of those returns is given in Table 19. The average drawn from all reports on yield of straw was 0.48 tons per acre.

METHODS OF SAVING STRAW

The resourcefulness and ingenuity of Kansas farmers were expressed profoundly by the methods and means which they devised to save alfalfa straw. Whereas there were only 21 methods of harvesting seed, there were 43 methods used to save straw. With so great a number of straw-saving methods, no one method was as outstanding as harvesting method 2A was among the methods of harvesting.

Possibilities for various methods of saving straw were more numerous following field combining than they were following stationary threshing. Only 4 methods could be distinguished as coming after threshing with a stationary thresher, and the rest of the 43 methods followed field combining.

Determination of Method of Saving Straw

The methods of saving straw were determined from Section X of the questionnaire where it was asked that the farm operators write the names of machinery used in caring for the straw.

Rank and Description of Methods of Saving Straw

A complete list of methods of saving straw is in Table 20. Each method

Table 19. Yield of straw on specified farms, in tons per acre.

County	Yield per acre on correspondent's farm	Correspondent's estimate of average yield in his locality
Roosha	0.25	0.33
McPherson	0.33	0.50
Reno	0.50	0.50
Barton	0.50	0.50
Finney 1/	1.00	1.00
	Yields reported on questionnaire	
Coffee	0.45	
Chautauqua	0.55	
Comanche	0.25	
Average of 7 reports	0.48	

1/ Irrigated.

Table 20. Numerical listing of methods of saving alfalfa straw with their respective codes

Code	Method description
	FOLLOWING FIELD COMBINING
1	Baled and put in barn.
2	Raked and stacked.
3	Raked and put in barn loose.
4	Buckraked and baled.
5	Stacked.
6	Pick-up baled
7	Raked, buckraked, and baled.
8	Ground and sold.
9	Left on field.
10	Pastured off.
11	Spread on newly planted field.
12	Hauled to feed rack.
13	Elevator attached to combine, loaded on wagon, stacked.
14	Sled drawn behind combine, piles left in field until fed.
15	Raked and baled.
16	Sled drawn behind combine, piles bucked, stacked.
17	Raked, buckraked, ensilage cutter, blown to stack.
18	Field hammermill.
19	Buckstacker.
20	Harrowed to spread over field.
22	Buckrake and stacker.
23	Sold in field.
24	Sled behind combine, stacked.
25	Sled behind combine, barn.
26	Ensilage cutter, stacked.
27	Sled behind combine, bunches baled.
28	Sled behind combine, hammermill, stack.
29	Buckraked to another field for fertilizer.
30	Loaded from combine, ensilage cutter, stacked.
30A	Loaded from combine, blower, stacked.
50	Raked, hauled for bedding.
51	Loaded from combine, sold.
52	Raked, hayloader, put in barn loose.
53	Loading attachment on combine, put in barn.
54	Sled, buckstacker.
55	Straw-shocker pulled behind combine, bunches hauled to feed rack.
55A	Straw-shocker pulled behind combine, bunches left in field.
56	Raked, bucked off field, burned.
57	Straw-shocker behind combine, bunches hauled to ensilage cutter, stacked.

- Continued

Table 20. (cont.)

Code	Method description
	FOLLOWING STATIONARY THRESHING
31	Blown from thresher directly into barn.
32	Blown from thresher into feed rack.
33	Thresher to stack.
33A	Stacked behind stationary combine.
34	Baled as soon as threshed.

Table 21. Methods of saving alfalfa straw; methods placed into similar-disposition groups.

Code	Method description
FOLLOWING FIELD COMBINING	
	Stationary Baling
1	Baled and put in barn.
4	Buckraked and baled.
7	Raked, buckraked and baled.
15	Raked and baled.
27	Sled behind combine, bunches baled.
	Pick-up Baling
6	Pick-up baler.
	Storing in Barn, Loose
3	Raked and put in barn loose.
25	Sled behind combine, barn.
52	Raked, hayloader, put in barn loose.
53	Loading attachment on combine, put in barn.
	Storing in Feed Rack, Loose
12	Hauled to feed rack.
55	Straw-shocker pulled behind combine, bunches hauled to feed rack.
	Stacking, Long Loose
2	Raked and stacked.
5	Stacked.
13	Elevator attached to combine, loaded on wagon, stacked.
16	Sled drawn behind combine, piles bucked, stacked.
19	Buckstacker.
22	Buckrake and stacker.
24	Sled behind combine, stacked.
54	Sled, buckstacker.
	Chopping and Stacking
17	Raked, buckraked, ensilage cutter, blown to stack.
26	Ensilage cutter, stacked.
28	Sled behind combine, hammermill, stack.
30	Loaded from combine, ensilage cutter, stacked.
30A	Loaded from combine, blower, stacked.
57	Straw-shocker behind combine, bunches harled to ensilage cutter, stacked.

- Continued

Table 21. (cont.)

Code	Method description
	Miscellaneous Disposition
8	Ground and sold.
9	Left on field.
10	Pastured off.
11	Spread on newly planted field.
14	Sled drawn behind combine, piles left in field until fed.
18	Field hammermill.
20	Harrowed to spread over field.
23	Sold in field.
29	Buckraked to another field for fertilizer.
30	Raked, hauled for bedding.
31	Loaded from combine, sold.
35A	Straw-shocker pulled behind combine, bunches left in field.
36	Raked, bucked off field, burned.
	FOLLOWING STATIONARY THRESHING
31	Blown from thresher directly into barn.
32	Blown from thresher into feed rack.
33	Thresher to stack.
33A	Stacked behind combine used stationary.
34	Baled as soon as threshed.

has a brief identifying description and a code number. More detailed descriptions are in following paragraphs.

Method 33 had the most users of any one method of handling straw. This method operated in connection with a stationary thresher and merely had the straw blown into a pile by the thresher. Ordinarily no attempt was made to stack the straw as it came from the blower, but occasionally an operator did have a man on the pile to control distribution of the straw and form a stack. This method was used in 55 of the 229 cases where method could be determined.

The second most popular system of saving straw was the use of a pick-up baler after a pick-up combine had threshed seed from a swath or windrow. The most serious fault that farm operators found with this method was the heavy loss of the valuable and nutritious leaves and other fine particles. Twenty farm operators used this method, code No. 6.

In 17 out of the 229 reports there were no attempts made to save straw. It was left on the field as it fell from the combine. Part of it was undoubtedly mixed in with the next cutting of hay and thereby utilized, but determination of just how much straw and the value of that straw thus utilized was impossible from this study. The number of reports of handling (or not handling, in this particular instance) straw by this method was large enough to rank it third in the list.

Fourth ranking method with 12 users was method No. 13. This method, used in connection with pick-up combining, was an innovation designed to save all the straw and chaff, thereby getting the maximum value from the straw. An elevator was attached to, or drawn with, the combine and placed so as to receive the discharged material directly and elevate it into a wagon or other transporting device. The straw was then hauled to a desirable location and stacked.

Table 22. Survey summary of methods of saving straw ranked according to frequency of use.

Rank	Method of saving straw	Number of reports
1	33	86
2	6	20
3	9	17
4	13	12
5	14	10
6	32	9
7	2	9
8	5	9
9	24	9
10	31	7
	All others	72
	Total	229

Table 23. Survey summary of methods of saving straw ranked according to frequency of use in specified type-of-farming areas.

Rank	Area B		Area BB		Area S	
	Method	Reports	Method	Reports	Method	Reports
1	33	11	33	7	33	10
2	6	5	9	7	32	2
3	9	3	24	5	6	1
4	32	2	13	3	31	1
5	13	2	14	3	32	1
	Others	15	Others	30	Others	3
Total		38		55		18

Fifth ranking method, having had 10 users, was method No. 14. This was another method designed to save all the straw and chaff coming from a pick-up combine. It was as simple and practical as it was effective. The method was to drag a platform with the combine in such a position that it caught the straw material as it was discharged from the combine. The straw was accumulated on the platform until the pile was of such proportions as the operator wanted, then it was dumped. Some were moved to the edge of the field before being dumped, and others were dumped wherever and whenever a load was accumulated. For this particular method the piles were left in the field until fed; however, other methods treated them differently.

The platforms were of various types and sizes. Some were sleds, but the most popular type was a float made of sheet steel sections welded together to make a single large sheet. Dimensions of the floats were not given in most cases; however, some were 9' x 12' and some were 10' x 12'.

Above are the 5 most important methods of saving straw. Their importance was based upon number of reports. Descriptions of some of the less frequently used methods follow.

Following the use of a stationary threshing machine, two methods other than method No. 33, described previously, were used. Method No. 31 was the blowing of straw from thresher into a barn, and had 7 users. By method No. 32, with 9 users, the straw was blown into a feed rack.

One farm operator baled the straw immediately after it was blown into a pile by the threshing machine.

Following the use of field combining methods of harvest, there are many more methods of handling straw than those previously described.

Other methods which employed the load-from-combine technique were Nos. 30 and 30A. In method No. 30 the straw after it was loaded was put through an

ensilage cutter and stacked as it emerged. In method 30A straw was put through a blower and blown into a stack. In method 53 straw was loaded from the combine then hauled to and put into the barn. One operator loaded from the combine then sold the straw (method 51).

There were other methods involving the use of sleds or floats dragged with the combine. Following are those methods and the respective disposition of the piles for each method.

Method No. 16. Piles were moved by a buckrake and then stacked. Five reports on this method.

Method No. 25. Piles hauled and put into barn. Four reports on this method.

Method No. 27. Piles were baled. Two reports.

Method No. 28. Piles hauled to hammermill which ground and blew the straw into a stack. Three reports of this method.

Method No. 34. Piles were gathered and stacked by a buckstacker. One report on this method.

By way of summary, a total of 34 farm operators reported that they used a sled or float to gather the straw back of their combines.

Many other methods were used to save the straw, many being the same as methods commonly used in handling hay after it is cut.

LABOR USED TO HARVEST ALFALFA SEED

Labor used on this crop has been divided into 4 parts:

1. Harvesting labor. (Field work and threshing)
2. Cleaning the seed.
3. Hauling and marketing the seed.
4. Caring for the straw.

Labor Used in Harvesting

The amount of labor required to harvest a given acre of alfalfa for seed depended primarily upon the harvesting method used. For this reason the labor on each of the more extensively used methods of harvesting is discussed in this section.

Labor Used to Harvest by Method 2A. As well over one-third of the Kansas alfalfa seed crop of 1946 was harvested by this method, the labor used is discussed thoroughly.

The amount of labor used could be calculated for 83 of the farms which used this method. Those amounts ranged from 0.6 to 3.3 man-hours per acre, with an average of 1.5 man-hours per acre.

The mowing and windrowing operation was universally done by one man. The most common mower used was a 7 ft. tractor mower. The average cost of mowing by all mowers was approximately 2.3 acres per hour. As this figure is comparable to performance of tractor mowers doing straight mowing, it may be concluded that the windrowing attachment does not materially slow down the mowing operation.

In pick-up combining a wider variation in performance and in man-hours labor per acre existed. The most common outfit used was a small combine of a 5 ft. or 6 ft. size operated by one man. Frequently another man was reported to have been in the crew on these small combines, but it was hard to determine whether he was along for the joy ride or whether he had a specific job to attend to while riding. It was commonplace to have two men in the crew operating larger combines, those of 8 ft. to 14 ft. in size. The average rate of combining by all combines was 1.46 acres per hour.

On farms having larger amounts of alfalfa seed, frequently an extra man was employed to care for the seed after it was dumped from the combine. Jobs

done by this worker in specific cases were: sacking the seed; spreading it out to dry; hauling it to storage; and similar jobs.

A Cowley county farm operator reported the smallest number of man-hours per acre on his farm of any using this method. He had 20 acres of alfalfa for seed which he mowed and windrowed in 6 hours using a 7 ft. tractor mower. Pick-up combining the 20 acres took him 6 hours, also. Thus 12 man-hours labor harvested this crop, 0.6 man-hours per acre.

On the other end of the range was a Ford county farm with 3.3 man-hours per acre in harvesting by this method. He mowed 38 acres in 56 hours with a 6 ft. tractor mower. He combined the 38 acres in 70 hours using a 6 ft. combine with pick-up fingers or guards as the pick-up device. The slowness of these operations was due to the fact that the seed-hay was large, as a result of irrigations, and the relatively heavy yield was 4 bushels of clean seed per acre.

The operations on a Chase county farm may be used as a good example of ones which took the method average of 1.5 man-hours per acre to complete. The operator of this farm mowed 26 acres in 10 hours with a 7 ft. tractor mower, and combined the 26 acres in 30 hours with a 6 ft. combine, thus requiring a total of 40 man-hours for the 26 acres.

Labor Used to Harvest by Method 2B. The amount of labor used by this method could be determined on 16 farms. These farms varied in use from 0.8 to 3.1 man-hours per acre with an average of 1.9 man-hours per acre.

The average rate of mowing on these 16 farms was 2.1 acres per hour. The average raking rate was 2.6 acres per hour and combining was done at the average rate of 1.8 acres per hour. In terms of hours per acre, the operations took 0.48, 0.38, and 0.55 hours, respectively.

A Barber county farm operator reported the smallest number of hours per acre of all who used this method. This operator mowed 14.7 acres with a 7 ft. tractor mower in 3 hours. He raked 14.7 acres with a 10 ft. dump rake in 4 hours. He pick-up combined the 14.7 acres with a 6 ft. combine in 3 hours. He stated on his questionnaire that the stand of alfalfa was very thin. As a result the windrows must have been far apart to allow for the fast rate of combining.

The crop which used the most labor of any using this method was on a Marshall county farm. The operator of this farm used 10 hours to mow 8 acres with a 5 ft. horse-drawn mower. He used 5 hours to rake the 8 acres with a 10 ft. horse-drawn dump rake. He used 10 hours in pick-up combining with a 6 ft. combine and a one-man crew. These operations gave a total of 25 hours spent in harvesting 8 acres of seed.

The average number of hours used per acre was obtained on a farm in Dickinson county. The operator of this farm cut 25 acres with a 7 ft. tractor mower in 10 hours. He raked the 25 acres in 10 hours with an 8 ft. tractor-drawn side-delivery rake. The pick-up combining was done in 20 hours by one man operating a 7 ft. combine. In addition, this farm operator employed a man for 10 hours to take care of the seed as it came from the combine. A total of 50 hours for the 25 acres gave 2.0 hours per acre, which is close to the average of all farms using this method.

Labor Used to Harvest by Method 1. Method No. 1, the method by which seed is combined from standing plants, requires the least amount of harvesting labor of all the methods. From this study the per acre labor use on 21 farms using this method could be determined. The range was from 0.5 to 1.8 man-hours per acre, with an average of 0.94 man-hours.

A Johnson county farm operator completed his harvesting by this method in the fastest time per acre. He combined 5 acres with a 5 ft. combine in 2 hours. Another one-half hour was spent in handling the seed from the combine to storage. Thus, harvesting the 5 acres was completed in a total of 2½ man-hours.

A Coffee county farm represented the high end of the range as 27 acres were combined in 48 hours with a 5 ft. combine.

For the farm which used the average number of man-hours per acre, a Rawlins county farm may be taken. On this particular farm 125 acres were combined in 120 hours with a 5 ft. combine for a rate of 0.96 man-hours per acre.

Labor Used to Harvest by Method 3. The labor use was figured for 14 farms using this method. From 2.5 to 8.2 was the range in man-hours per acre with an average of 4.4 man-hours.

A Geary county farm operator was on the low end of the range with 2.5 man-hours per acre. The binding operation on this farm took 10 hours for the 16 acres. Shocking was done in 10 hours. Hauling and threshing was done by a 5-man crew in 4 hours. The total of 40 man-hours gave this farm 2.5 man-hours per acre used to harvest the crop.

At the high end of the range is a Marion county farm. The operator of this farm did the 11 acre binding job in 7 hours with a 2-man crew. A tractor-drawn 7 ft. binder was used. The shocking was done in 16 man-hours by 2 workers. Six men hauled and threshed the 11 acres in 10 hours. Thus a total of 90 man-hours were used to harvest the 11 acres on this farm, an average of 8.2 per acre.

On a Woodson county farm the harvesting operations for method 3 used very close to the average number of hours for this method. Binding 17½ acres on

this farm took 8 hours with a 7 ft. binder and a 2-man crew. Shocking was done in 14 hours with a crew of 3. Hauling and threshing was done in 6 hours with a crew of 9 men. All operations in harvesting the 17½ acres were completed in 84 man-hours, an average of 4.8 man-hours per acre.

Labor Used to Harvest by Method 3A. The amount of labor used per acre could be calculated for 11 of the farms using this method of harvesting. The range was 0.6 to 3.5 man-hours per acre, with an average of 1.8.

The most efficient user of labor was a Reno county farm operator. On his farm 50 acres of alfalfa seed-hay were windrowed with a 12 ft. windrower in 12 hours. One man operated the outfit. These 50 acres were pick-up combined in 16 hours by one man operating a 12 ft. combine. The result was 50 acres harvested in 28 man-hours for an average rate of 0.6 man-hours per acre.

The operations on a Rawlins county farm were not so expeditiously done. It is placed at the high end of the range of man-hours per acre for this method. A review of the operations shows that cutting and windrowing 20 acres with a 10 ft. power binder and 2 men was done in 10 hours. The combining was done in 25 hours by 2 men with a 12 ft. combine. A total of 70 man-hours was spent in harvesting 20 acres on this farm.

The method average of 1.7 man-hours per acre was closely approached on a Barber county farm. On this farm 15 acres of alfalfa were cut and windrowed in 6½ hours by a 2-man crew with a binder. The 15 acres were combined in 7 hours by a 2-man crew operating a 7 ft. combine. The total man-hours labor used was 27 and the average per acre was 1.8.

Labor Used to Harvest by Method 3D. Years ago, before the advent of the combine, this method was a standard method of harvesting alfalfa seed. Even today it is important in some areas. For comparison purposes, a discussion of the labor used by this method is given here.

Table 24. Man-hours labor used to harvest alfalfa seed by specified methods of harvesting.

Rank	Method of harvesting	Number of observations	Range in man-hours per acre		Average man-hours per acre
			Low	High	
1	1	21	.5	1.8	.9
2	2E	6	.9	1.5	1.1
3	2A	85	.6	3.3	1.5
4	3A	11	.6	3.5	1.7
5	2C	9	1.0	3.8	1.9
6	2B	16	.8	3.1	2.0
7	6	7	1.5	4.5	2.8
8	3C	7	2.4	5.7	3.7
9	5	2	2.6	5.1	3.9
10	3	14	2.5	8.2	4.4
11	6A	4	3.7	5.25	4.5
12	3D	7	2.9	6.9	4.9
13	3B	3	3.45	7.0	5.0
14	2D	2	5.1	6.4	5.75
15	4	2	7.0	7.5	7.25
16	5C	4	5.4	18.4	11.4

The amount of labor used could be calculated for 7 farms. The range in man-hours per acre on those farms was from 2.9 to 6.9.

On a Nemaha county farm 15 acres of seed were mowed by horse-drawn mowers in 16 hours. Raking was done with a horse-drawn side-delivery rake in 10 hours. Bunching took 5 man-hours. Hauling and threshing was done by a small crew of 3 men in 4 hours. Total man-hours used was 43, an average of 2.9 man-hours per acre.

The method average of 4.9 man-hours per acre was closely approached on a Riley county farm which used 5.0 man-hours per acre. The harvesting operations on this farm were as follows: Mowing, 9 acres in 9 hours with a horse-drawn 6 ft. mower; raking, 9 acres in 5 hours with a horse-drawn 10 ft. side-delivery rake; bunching, 9 acres by 2 men in 3 hours, giving 6 man-hours of labor; hauling and threshing, done by a 5-man crew in 5 hours, giving 25 man-hours of labor. The total number man-hours was 45 for the 9 acres.

Types of Labor Used to Harvest Alfalfa Seed. Table 25 gives the breakdown of labor used to harvest alfalfa seed on several farms harvesting by each of 4 important methods.

Outstanding are the facts that the bulk of labor used by methods 1 and 2A was farm operator labor, whereas the bulk of labor used to harvest by methods 3 and 3C was hired labor. This may be explained by the fact that combining was done largely by one-man crews, that one man usually being the farm operator. A crew of several men was required for harvesting when stationary threshing methods were used. Only one member of the threshing crew could be the farm operator, the remainder were mostly hired persons.

Table 25. Types of labor used by specified methods of harvesting alfalfa seed

Items	Method 1	Method 2A	Method 3	Method 5E
Total number of farms for which labor classification was determined	21	74	9	5
Number of farms using:				
Operator labor	16	64	9	5
Family labor	4	12	4	3
Hired labor	2	14	7	4
Exchange labor	--	5	7	3
Custom labor	5	31	7	3
Percent of total number man-hours harvest labor on above farms done by:				
Operator labor	67.9	59.1	24.1	18.1
Hired labor	3.0	5.9	9.1	1.5
Family labor	10.9	22.2	34.6	64.1
Exchange labor	--	1.9	24.4	11.7
Custom labor	18.2	10.8	7.8	4.3

Labor Used in Cleaning Alfalfa Seed

Alfalfa seed ordinarily goes through a cleaning process before it enters commercial trade channels. Some growers like to clean their seed on the farm before selling, while others have their seed custom cleaned by commercial cleaners. And some producers turn over the seed "in dirt" to the purchaser who cleans it and then pays for it on a clean-seed basis.

Eighty of the farm operators in this study cleaned their seed at home. No information was gathered on the size and types of fanning mills which they used. The only distinction made was that some cleaning jobs were done by 2-man crews, and others were done by one-man crews. It is probable that the one-man crews cleaned with power driven mills, and the 2-man crews used fanning mills which were hand powered, one of the 2 crew members turning the mill while the other fed the seed into it.

Whereas labor used in harvesting was given in terms of man hours per acre, the labor used in cleaning is in terms of man-hours per bushel.

There apparently was no significant difference in the amounts of labor used in cleaning seed threshed by the various methods. The big difference in amounts of labor used came from the difference in number of men engaged in the operations. The over-all average labor used was about 0.2 man-hours per bushel, which amounts to cleaning 5 bushels per hour, or one bushel in 12 minutes.

Twenty reports on 2-man crews cleaning seed gave an average rate of 0.43 man-hours per bushel, which was about 0.22 operational hours per bushel which in turn amounted to cleaning 4½ bushels per hour.

Sixty reports on one-man crews cleaning seed gave an average rate of 0.15 hours per bushel, or 6 2/3 bushels per hour. The source of power in general

accounted for the difference between the rates of performance between the 2-man and the one-man crews.

Labor Used in Hauling and Marketing

The questionnaire did not cover hauling and marketing labor in a direct and specific question, but 11 farm operators wrote in information concerning this operation. These 11 farms reported a combined total of 50 hours to haul and market their combined total of 1,113.3 bushels of seed, which gave a weighted average of 0.04 man-hours per bushel.

Small quantities of seed on individual farms may take substantially greater amounts of labor per unit than do large quantities.

In some cases the buyer called for and picked up the seed at the producer's farm. When that was done, it represented no time and labor, or only a negligible amount, to be charged to the seed crop.

However, in most cases, the seed was delivered to the buyer at his place of business. In preparing the seed for hauling, loading, and then hauling it to the market place, there were expended time and labor which must be charged to the seed crop.

Many farm operators had only a few pounds of seed to sell. They may have put that seed into a sack or two, placed it in the family car, and took it to town on a regular trip. It is doubtful whether the time spent in going to town in a case of that sort should be charged against the alfalfa seed crop.

Labor Used in Saving Alfalfa Straw

Although labor spent on saving alfalfa straw has no direct connection with the handling of seed, it is an important component of the over-all crop

Table 26. Labor used by specified methods of saving straw.

Rank	Method of saving straw	Number of observations	Man-hours labor per acre		
			Range		Average
			Low	High	
1	31	7	0.0	0.0	0.0
2	32	5	0.0	0.0	0.0
3	33	38	0.0	0.9	0.07
4	19	5	0.25	0.6	0.45
5	17	2	0.7	0.8	0.75
6	24	3	0.4	1.2	0.8
7	5	4	0.33	1.7	0.9
8	14	2	0.6	1.4	1.0
9	6	8	0.25	2.4	1.0
10	3	7	0.5	2.5	1.4
11	28	2	0.8	2.0	1.4
12	2	5	0.9	2.4	1.6
13	13	6	0.6	3.2	1.6
14	12	3	1.4	2.6	1.9
15	22	2	1.0	3.0	2.0

labor. Reference to the section on methods of saving straw shows that method No. 33 was the method used in the greatest number of cases. Labor use could be determined for 38 cases where this method was used. Of these, 32 used no man-labor whatsoever specifically on the straw. The other 6 cases varied in labor use from 0.1 to 0.9 man-hour per acre.

Pick-up baling was the second most popular system of saving straw. The amount of labor used by this method was determined for each of 8 farms. That labor ranged from 0.25 to 2.4 man-hours per acre, with an average of 1.0 man-hour per acre.

It was possible to calculate the labor used on 6 farms which employed the No. 13 method to save straw. Labor used on those farms varied from 0.6 to 3.2 man-hours per acre with an average of 1.6 man-hours per acre.

For straw-saving method No. 14 two farms reported an average use of 1.0 man-hour per acre. The labor for this method was used in unloading the float and for a small amount of touching-up of the piles.

When straw was raked, hauled and hand-stacked, method No. 2, an average of 1.6 man-hours per acre was reported by 5 farms.

The labor used by other methods of saving straw is given in Table 27, which lists all methods for which labor could be calculated, with the amount each method used.

CUSTOM WORK IN HARVESTING ALFALFA SEED

Custom work was important in harvesting the 1946 alfalfa seed crop. Farm operators who did not have the equipment to perform certain operations hired them done by custom work. Operations which involved the use of heavy machinery, such as combines and threshing machines, were more often custom-hired than those which used such lighter machines as mowers and rakes.

Table 27. Labor used by methods of saving straw (numerical listing of methods).

Method of saving straw	Number of observations	Man-hours per acre		
		Range		Average
		Low	High	
FOLLOWING FIELD COMBINING				
2	5	0.9	2.4	1.6
3	7	0.5	2.5	1.4
4	1	-	-	2.0
5	4	0.33	1.7	0.9
6	8	0.25	2.4	1.1
7	1	-	-	2.3
8	1	-	-	2.3
12	3	1.4	2.6	1.9
13	6	0.6	3.2	1.6
14	2	0.6	1.4	1.0
16	1	-	-	0.5
17	2	0.7	0.8	0.75
18	1	-	-	1.65
19	3	0.25	0.6	0.45
20	1	-	-	0.6
22	2	1.0	3.0	2.0
24	3	0.4	1.2	0.83
26	1	-	-	1.5
27	1	-	-	1.3
28	2	0.8	2.0	1.4
29	1	-	-	0.8
30	1	-	-	0.4
31	1	-	-	0.3
33	1	-	-	0.6
34	1	-	-	1.4
35	1	-	-	0.5
35A	1	-	-	1.8
FOLLOWING STATIONARY THRESHING				
31	7	0.0	0.0	0.0
32	5	0.0	0.0	0.0
33	38	0.0	0.9	0.07
33A	1	-	-	2.1

About 35 percent of the farm operators who combined from windrows custom-hired the work. Approximately 75 percent of the custom operators charged by the acre for combining. The average charge, weighted by number of acres combined under each charge, was $3.90 per acre. Some custom operators charged by the bushel; others charged by the hour of work. No matter by which unit the charge was made, conversion to other units showed that the charges were not very different.

Custom threshing was employed relatively more than was custom combining. Sixty percent of the farm operators who used stationary threshers custom-hired the work. About 70 percent of the custom operators charged by the bushel for threshing. The average charge, weighted by number of bushels threshed under each charge, was $1.65 per bushel. A few operators charged by the hour; others charged by such units as pound, sack, cwt., or an entire job.

HIRED LABOR IN ALFALFA SEED HARVESTING

The importance of hired labor in harvesting alfalfa seed is decreasing. With such a large and increasing use of combines for threshing alfalfa seed, it is necessary to hire less hand labor than formerly when most of the seed was threshed with stationary threshers.

The amount of hired labor used in those farms for which it could be determined is given in Table 25.

Section IV of the questionnaire was used to gather information on wages paid to hired labor in 1946. The results of the section are given in Table 28. It is shown that the number of farm operators hiring workers by the hour and the number hiring by the day are about equally divided. Those

Table 28. Wages paid to hired labor for work in harvesting the 1946 alfalfa seed crop

Type-of-farming area	Labor hired by the hour: Number of farms hiring	Labor hired by the hour: Average hourly wages ($)	Labor hired by the day: Number of farms hiring	Labor hired by the day: Average daily wages ($)	Regular hands: Number of farms hiring	Regular hands: Average monthly wages ($)
1	-	-	-	-	-	-
2	1	.55	3	5.00	-	-
3	2	.75	1	10.00	-	-
4	-	-	2	6.50	-	-
5	5	.76	9	4.83	2	115.00
6A	5	.85	4	6.75	-	-
6B	16	.93	16	6.81	-	-
7	4	.82	1	3.00	-	-
8	4	.81	4	6.62	-	-
9	5	1.00	5	7.94	1	150.00
10A	3	1.00	2	7.00	-	-
10B	4	.94	2	8.00	-	-
10C	7	1.01	-	-	-	-
11	1	.50	7	7.14	1	100.00
12	1	1.00	3	7.67	-	-
Total	58	.89	59	6.60	4	120.00

workers who were hired by the hour were paid an average of $0.89 per hour, and those hired by the day were paid an average of $6.60.

PRODUCER'S DISPOSITION OF THE 1946 CROP

Three primary ways in which producers disposed of their seed were: Sold to dealers; sold to farmers; and kept on the farm. Complete disposition of seed from each of 227 farms was established from the survey. These farms had a total of 14,857 bushels. The disposition is given in Table 29. Almost 92 percent of the seed was sold to dealers. Only 2.5 percent was sold directly to farmers, while 5.7 percent was kept on the farm. Most of the seed that entered commercial channels went to states east of Kansas for planting. Only a small portion of the seed sold to dealers was sold back to Kansas farmers for planting.

PRICES RECEIVED FOR THE 1946 CROP

Information about prices which farm operators received for their alfalfa seed was given in answer to question 6 in section XI of the questionnaire. The amount of seed sold and the price for which it was sold could be determined for 214 farms. These 214 farms had a combined total sales of 813,647 pounds (or 13,560.8 bushels). The average price received per pound was about 35 cents, weighted by the amount sold, for the study as a whole. Table 30 gives the weighted average price received in each type-of-farming area.

That average price depended largely on the price received for Kansas Common seed. Sale prices of Grimm and Ladak seed were consistent with the prices for comparable grades of Kansas Common, while Buffalo alfalfa seed sold at much higher prices. According to Table 31 the average price for

Table 29. Producers' disposition of the 1946 alfalfa seed crop by type-of-farming area.

Type-of-farming area	No. of farms for which complete seed disposition could be determined	No. of bushels for which disposition could be determined	Percent of seed kept on farm 1/	Percent of seed sold to farmers 1/	Percent of seed sold to dealers 1/
1	4	53.5	12.2	-	87.8
2	14	772.6	6.8	0.3	92.9
3	8	165.8	33.1	6.1	61.8
4	14	256.5	18.6	3.6	77.8
5	37	2,142.1	8.8	1.6	89.6
6A	16	599.4	10.8	-	89.2
6B	51	3,267.4	4.1	1.1	94.8
7	7	409.9	2.2	6.0	91.8
8	17	1,031.4	6.0	-	94.0
9	21	1,769.3	6.8	12.0	80.2
10A	2	626.7	-	-	100.0
10B	9	1,662.3	2.5	5.4	92.1
10C	13	953.2	0.7	-	99.3
11	9	448.3	11.8	-	88.2
12	5	698.5	0.2	-	99.8
Total	227	14,856.9	5.7	2.5	91.8

1/ Up until March 1947 when the questionnaires were filled in.

Table 30. Prices received for all alfalfa seed sold by producers, 1946.

Type-of-farming area	Number of farms quoting amount sold and price	Number of pounds sold	Weighted average price
1	3	2,818	$ 0.330
2	14	43,182	.339
3	7	6,061	.353
4	12	12,530	.351
5	36	117,227	.341
6A	14	29,139	.334
6B	49	187,996	.350
7	6	21,638	.365
8	16	50,988	.325
9	20	94,117	.448
10A	2	37,600	.354
10B	8	88,016	.341
10C	13	56,775	.348
11	9	23,720	.325
12	5	41,840	.337
Total	214	813,647	.353

Table 31. Prices received for Buffalo alfalfa seed sold by producers, 1946.

Type-of-farming area	Number of farms quoting amount sold and price	Number of pounds sold	Weighted average price
5	1	2,100	$ 0.750
6B	1	1,080	.650
7	1	1,490	.550
9	4	11,788	.971
Total	7	16,458	.884

Buffalo seed was over 88 cents per pound. This price included, however, some sales made by individual producers at retail prices. Represented in this Table are 7 farms from which were sold 16,458 pounds of Buffalo seed. Other farms, for which the quantity sold could not be precisely associated with a quoted price, reported sales prices consistent with those given in Table 31.

According to the amount of information available there was little spread between prices received by producers for certified seed and prices for noncertified seed. One farm operator stated he received 3 cents per pound more for certified than for noncertified Kansas Common. Other farm operators who produced certified Kansas Common received one to one and one-half cents per pound more than noncertified seed was bringing, if, indeed, they received any premium at all.

The spread between prices of certified and noncertified Buffalo seed was much greater than the spread between certified and noncertified Kansas Common. This fact may be interpreted as a more or less natural phenomenon which accompanies the initial and rapid spread of a valuable new variety. The price spread between grades of this Buffalo variety may be estimated at approximately 10 to 15 cents per pound for the 1946 crop.

In 1946 farm operators who cooperated in the Agricultural Conservation Program of the United States Department of Agriculture were eligible to receive a subsidy for harvesting alfalfa seed, with the provision that the seed be sold and delivered into commercial channels by January 1, 1947. Payments to Kansas cooperators were 7 cents per pound of clean seed, with a maximum payment of $35.00 to any one producer. The addition of this subsidy brought the total value of seed up to 42 cents per pound for the first 500 pounds produced by a farm operator cooperating with the A.C.P.

USE AND VALUE OF CLEANINGS

Much of the material separated from seed in the seed-cleaning process had a real value. The most valuable portion of the cleanings were those seeds still contained in unthreshed pods, or sections of pods, and those small and shriveled seeds which were too light to be carried with the clean seed. Farm operators with a will to squeeze the utmost from their alfalfa seed crop utilized the cleanings in one of various ways. Sixty six farm operators reported that they used, or definitely intended to use, cleanings in a manner which enabled them to realize some value. The uses fell into 3 principal classifications as follows:

1. Feeding. This use was reported on 32 farms. On individual farms the cleanings were fed to sheep, to beef cattle, to dairy cattle, to chickens, and to turkeys. Some farm operators ground the cleanings before feeding them.

2. Planting. This use was reported on 28 farms. The most frequent form of planting was actual sowing to get a new stand of alfalfa. One operator planted cleanings with oats; several planted with brome grass to make temporary pasture; some scattered cleanings on old alfalfa fields to thicken the stand thereon; others scattered their cleanings over pasture land.

3. Actual sale. At least 4 farm operators sold their cleanings to neighbors for planting. No prices were quoted on these transactions.

In addition to the number of farm operators who employed the above uses, 34 farm operators retained their cleanings. This fact evidenced intention to utilize them in some way.

Since feeding was such a common use of the cleanings, an estimate of their value was obtained by estimating their analysis as a feedstuff, and then assuming the price of a common feedstuff with similar analysis. The presence of

seeds in the cleanings classifies those cleanings as a concentrate having the characteristics of a protein supplement. The estimated fat and protein content resemble wheat middlings. The September, 1946 to February, 1947 average price which farmers paid for wheat middlings was approximately $2.70 per cwt. as reported in the monthly "Agricultural Prices" released by the Bureau of Agricultural Economics, U. S. Department of Agriculture.

In conclusion, then, the farm operators who fed alfalfa seed cleanings realized an approximate $2.70 per cwt. value from those cleanings.

LANDLORD'S SHARE IN EXPENSES AND CROP

Ninety one of the farm operators who harvested alfalfa seed from land rented on a crop-share basis stated the proportion of the crop which went to the landowner as payment for rent. This information was obtained from questions 12 and 13 of section XI of the questionnaire.

In 41 cases the tenant farmer reported that his landlord did not share in the costs of harvesting. Sixteen of these landlords received one-third on the crop while 24 received one-half of the crop harvested from their land.

In 50 cases the tenant reported that his landlord did share in the harvesting expenses. The landlord most commonly shared one-half of the expenses and received one-half of the crop. Forty tenants reported the half and half basis with about one-third of them specifying that the landlord paid "one-half of the threshing bill;" the others merely indicated "one-half" with no modification.

One landlord paid two-fifths of the expenses and received two-fifths of the crop.

Three tenants stated that their landlords gave them the straw as payment for harvesting. Two of these took one-half of the seed, and the other land-

lord took two-fifths of the seed. It may be possible to assume, since some farm operators did specify that straw was expense payment on the part of the landowner, that the farm operators who indicated that the landowner did not share in expenses actually did not consider the straw as payment.

Another method landlords used to share in harvesting expenses was by cash payment on either a bushel or an acre basis, depending upon method of harvest that was used. These unit payments were $0.50, $1.50, or $2.00 per bushel; or $1.00 per acre in actual cases reported.

DESTINATIONS OF KANSAS GROWN ALFALFA SEED

That portion of the Kansas alfalfa seed crop of 1946 which entered commercial trade channels was distributed to many parts of the United States. It is a difficult matter to determine the proportion of the commercially sold seed which was sold back to Kansas farm operators for planting and which was shipped to other states for planting.

A manager of one of the largest seed houses in Kansas estimated that his company sold only about one-tenth of the seed that they handled back to Kansas farmers for planting. With this estimate came a cautioning that the amount of seed planted by Kansas farmers depends to a great extent on the weather conditions at planting time. In the fall of 1946 there was more seed sown than usual.

This same manager also wrote: "The states to which we shipped the bulk of our seed were Iowa, South Dakota, Minnesota, Wisconsin, Michigan, Missouri, Illinois, Indiana, Ohio, Virginia, Arkansas, Kentucky, and Tennessee. Small lots went to other states."

A Butler county farm operator wrote that he "retailed the certified seed into Kansas, Missouri, Wisconsin, Illinois, Kentucky, Tennessee, North Carolina,

Pennsylvania and Ohio." He sold both Kansas Common and Buffalo varieties.

A Reno county farm operator sold his seed to an Iowa seed house.

A Pawnee county producer sold his seed to 10 different places ranging from Kansas to Alabama.

A Pratt county farm operator sold his Buffalo seed to farmers in Kansas, Iowa, and Vermont.

A Stafford county seed grower filled orders for certified Buffalo from many places, the extreme points being Rhode Island, California, and Texas. However, the bulk of his seed went to states to the east of Kansas.

COST OF PRODUCTION

To know how much it costs to produce a crop is vital if it is to be learned whether or not that crop is a profitable one. This section is pointed toward showing the profitableness of growing alfalfa seed under the set of conditions which existed in 1946.

Major items in the cost of producing alfalfa seed were ascertained directly from the survey, but for other items, those which were not specifically covered by the information gathered in the study, a reasonable estimate was made in order to get a complete set of costs which were charged against the seed crop.

Due to the fact that the complete set of cost data were not obtained on the questionnaire, actual costs experienced on an individual farm, or on a specific group of farms are not presented. Hypothetical cases are set up to demonstrate costs incurred. These hypothetical cases use average amounts of cost factors, which have been worked out in their respective sections previously presented in this study. The income is based on average production figures given in previous sections.

Accompanying the hypothetical cases are necessary assumptions which serve to give a realistic attitude of possible application. These assumptions are:

1. Full ownership of the farm.
2. All machinery owned by the farm operator.
3. Farm operator's labor is valued same as hired labor was paid.
4. No irrigation.
5. All power for field work and hauling furnished by tractor.
6. No subsidy received.

Items of cost are listed in tables presented in this section, while an explanation of how each of the items of cost was developed is in following paragraphs.

Harvesting Costs (Field work and threshing).

1. Labor. For each method of harvesting the average number of man-hours per acre, as calculated in a previous section and set forth in Table 24, was used in computing cost of labor. All labor was charged at the average hourly rate paid to hired workers as presented in Table 28.

2. Machine Costs. The hourly cost of operating was estimated for each machine used. These costs include depreciation, maintenance, repairs, housing, and fuel (in the case of tractors, trucks, and machines with auxiliary engines) all prorated according to probable annual use. Machine costs do not include wages (labor cost) for the machine operator.

Cleaning Seed Costs. An equal charge for cleaning seed was applied to all methods of harvesting.

1. Labor. As previously established in the section on seed cleaning, this operation took an average of 0.15 man-hours per bushel. To convert this to a per-acre basis, the over-all average yield of 2.1 bushels was applied.

This gave 0.32 man-hours per acre for cleaning the seed.

2. Machine Costs. In this case, the machine involved was the fanning mill which is a long-lived machine of relatively small cost. Therefore the hourly cost of operating was small.

Hauling and Marketing Costs. An equal charge for this item was applied to all methods of harvesting.

1. Labor. Hauling and marketing labor was found to be 0.04 man-hours bushel. To convert to an acre basis, the average yield of 2.1 bushels was applied.

2. Machine Costs. Truck or auto costs were given a nominal rate of $1.00 per hour, excluding driver's wage.

Straw-Saving Costs. To represent the cost of saving straw after field combining of the seed, the pick-up baler method was selected. No costs of saving straw are charged following the threshing of seed with a stationary thresher, as it was the common practice not to use labor on the straw pile as it formed from the thresher.

1. Labor. Pick-up baling system. The average amount of labor used by farm operators employing this system of saving straw was 1.0 man-hours per acre. This included the labor for both baling and hauling. The straw yield was very light, amounting to less than one-half ton per acre, or only about 12 80-pound bales.

2. Machine Costs. Pick-up baling system. The cost of using the baler was the major part of the machine costs of saving straw. It was assumed that the hauling was done by rack and tractor.

Miscellaneous Costs. These costs are charged to all methods of harvesting.

1. Interest on land investment. A simple and straightforward way of figuring this item was to assign a nominal per-acre value to the cropland and apply to it the rate of interest which existed on farm mortgages at that time. The factors used are, respectively, $100.00 and 4.4[1/] percent.

2. Land tax. The seed crop assumed responsibility for only one-half of a reasonable per-acre real estate tax of $0.60. The hay crops harvested from the land bore the other one-half of the land tax.

3. Overhead charges. A small, token charge was held against the seed crop to represent its share in the general operating expenses of the farm. Recognized in this charge are such items as:

a. Buildings charge derived from use of buildings where seed was stored and/or processed.

b. Share in cost of protective fencing.

c. Management charge for making contacts necessary to sell the crop. (Letters, telephone calls, visits to dealer, etc.)

d. A charge for labor expended in "getting ready" to do the field work of harvesting.

e. The seed crop's share of that incidental labor not chargeable to any specific farm enterprise, yet necessary to keep the farm operating as a business unit.

Total overhead charge amounted to $0.80 per acre for the seed crop.

4. Stand depreciation and reseeding costs. Under 1946 conditions, it would have taken an estimated $7.80 worth of seed, materials, machinery costs, and labor to establish a stand of alfalfa on one acre. Assuming that the

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1/. Bureau of Agricultural Economics. Preliminary average rate for Kansas, 1946. Unpublished.

stand would last for 6 years, the annual charge would be $1.30 per acre, one-half of which was charged to the seed crop.

5. Miscellaneous materials. Materials such as sacks, bags, twine for tying bags, etc., brought a small charge of $0.35 per acre against the seed crop.

A summation of these total costs is shown in Table 32 for each of the hypothetical cases used for illustration. These total costs are charges which must be reckoned with under the set of conditions imposed by the assumptions stated at the beginning of this section before calculating profits derived from the growing and harvesting a crop of alfalfa seed. Tables 33-37 list costs in detail.

INCOME FROM SEED CROP

Income from a given acre of alfalfa seed was derived from 3 sources which are:

1. Seed. Income from the seed was calculated by using the previously determined average yield of 2.1 bushels and applying the average price received, $0.353 per pound, which gave an average income of $44.48 per acre.

2. Straw. The average yield of straw per acre was 0.48 tons. Straw was valued at one-half the value of alfalfa hay. The average price per ton of loose alfalfa hay for the 6-month period of October, 1946 to March, 1947, inclusive, received by farmers was $21.25.[1/] This made the straw value $10.62 per ton, and made 0.48 tons worth $5.09.

3. Cleanings. The value of the cleanings was determined in a previous section to be $2.70 per cwt. The amount of cleanings per acre was determined

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1/. U. S. Dept. of Agr. Agricultural Prices. Washington: Bureau of Agricultural Economics, October, 1946 to March, 1947.

Table 32. Cost of producing alfalfa seed in 1946 by specified methods of harvesting. Hypothetical cases.

Item	Method 1	Method 2A	Method 2B	Method 3	Method 3D
Cost ($ per acre):					
Harvesting	2.16	2.96	3.44	6.62	6.69
Cleaning seed	.30	.30	.30	.30	.30
Hauling & marketing	.15	.15	.15	.15	.15
Saving straw	2.68	2.68	2.68	.00	.00
Miscellaneous	4.30	4.30	4.30	4.30	4.30
Total cost	9.59	10.39	10.87	11.37	11.44
Income ($ per acre):					
Seed	44.48	44.48	44.48	44.48	44.48
Cleanings	.73	.73	.73	.73	.73
Straw	5.09	5.09	5.09	5.09	5.09
Total income	50.30	50.30	50.30	50.30	50.30
Management income ($ per acre)	40.71	39.91	39.43	38.93	38.86

Table 33. Alfalfa seed production costs and income in 1946 by method of harvesting 2A. Hypothetical Case.

Item	Quantity per acre	Hourly cost	Total cost per acre
		$	$
COSTS:			
Harvesting:			
Man-hours	1.5	.89	1.34
Mower (with windrow attach.) hr.	.4	.20	.08
Combine (with pick-up) hr.	.7	1.10	.77
Tractor hours	1.1	.70	.77
Total harvesting costs			2.96
Cleaning seed:			
Man-hours	.32	.89	.28
Fanning mill hours	.32	.05	.02
Total cleaning costs			.30
Hauling and marketing:			
Man-hours	.08	.89	.07
Truck or auto hours	.08	1.00	.08
Total H. and M. costs			.15
Saving straw:			
Man-hours	1.00	.89	.89
Pick-up baler hours	.6	1.40	.84
Wire bale ties			.30
Rack wagon hours	.3	.05	.02
Tractor hours	.9	.70	.63
Total saving straw costs			2.68
Miscellaneous:			
Interest on land investment			2.20
Land tax			.30
Overhead			.80
Stand depreciation and reseeding			.65
Sacks, bags, twine, etc.			.35
Total miscellaneous			4.30
Total all costs			10.39
INCOME:			
Seed			44.48
Cleanings			.73
Straw			5.09
Total income			50.30
MANAGEMENT INCOME			39.91

Table 34. Alfalfa seed production costs and income in 1946 by method of harvesting 2B. Hypothetical case.

Item	Quantity per acre	Hourly cost	Total cost per acre
		$	$
COSTS:			
Harvesting:			
Man-hours	2.0	.89	1.78
Mower hours	.4	.15	.06
Rake hours	.3	.10	.03
Combine (with pick-up) hrs.	.6	1.10	.66
Tractor hours	1.3	.70	.91
Total harvesting costs			3.44
Cleaning seed:			
(Same as for Method 2A)			.30
Hauling and marketing:			
(Same as for Method 2A)			.15
Saving Straw:			
(Same as for Method 2A)			2.68
Miscellaneous:			
(Same as for Method 2A)			4.30
Total all costs			10.87
INCOME:			
Seed			44.48
Cleanings			.73
Straw			5.09
Total income			50.30
MANAGEMENT INCOME			39.43

Table 35. Alfalfa seed production costs and income in 1946 by method of harvesting 1. Hypothetical case.

Item	Quantity per acre	Hourly cost	Total cost per acre
		$	$
COSTS:			
Harvesting:			
Man-hours	.9	.89	.80
Combine hours	.8	1.00	.80
Tractor hours	.8	.70	.56
Total harvesting costs			2.16
Cleaning seed: (Same as itemized under Method 2A)			.30
Hauling and marketing: (Same as itemized under Method 2A)			.15
Saving straw: (Same as itemized under Method 2A)			2.68
Miscellaneous: (Same as Method 2A)			4.30
Total all costs			9.59
INCOME:			
Seed			44.48
Cleanings			.73
Straw			5.09
Total income			50.30
MANAGEMENT INCOME			40.71

Table 36. Alfalfa seed production costs and income in 1946 by method of harvesting 3. Hypothetical case.

Item	Quantity per acre	Hourly cost	Total cost per acre
		$	$
COSTS:			
Harvesting:			
Man-hours	4.4	.89	3.92
Binder hours	.6	.75	.45
Binder twine			.15
Rack wagon hours	1.5	.05	.08
Thresher hours	.5	.40	.20
Tractor hours	2.6	.70	1.82
Total harvesting cost			6.62
Cleaning seed:			
(Same as for Method 2A)			.30
Hauling and marketing:			
(Same as for Method 2A)			.15
Saving straw:			.00
Miscellaneous:			
(Same as for Method 2A)			4.30
Total all costs			11.37
INCOME:			
Seed			44.48
Cleanings			.73
Straw			5.09
Total income			50.30
MANAGEMENT INCOME			38.93

Table 37. Alfalfa seed production costs and income in 1946 by method of harvesting 3D. Hypothetical case.

Item	Quantity per acre	Hourly cost	Total cost per acre
		$	$
COSTS:			
Harvesting:			
Man-hours	4.9	.89	4.36
Mower hours	.4	.15	.06
Rake hours	.3	.10	.03
Rack wagon hours	1.6	.05	.08
Thresher hours	.5	.40	.20
Tractor hours	2.8	.70	1.96
Total harvesting cost			6.69
Cleaning seed:			
(Same as for Method 2A)			.30
Hauling and marketing:			
(Same as for Method 2A)			.15
Saving straw:			.00
Miscellaneous:			
(Same as for Method 2A)			4.30
Total all costs			11.44
INCOME:			
Seed			44.48
Cleanings			.73
Straw			5.09
MANAGEMENT INCOME			38.86

as follows: Average yield of 2.1 bushels clean seed was 78 percent (Table 13) of the total volume of thresher-run seed, which made 2.7 bushels total volume of thresher-run seed per acre. This then left 0.6 bushel cleanings per acre. The estimated weight of cleanings was 45 pounds per bushel volume which made a total of 27 pounds of cleanings per acre. Then 27 pounds @ $2.70 per cwt. equals $0.73 per acre as the value of the cleanings.

Total income is the sum of the above 3 items, or $50.30 per acre.

Management income ranged from $38.86 to $40.71 per acre for the 5 selected methods of harvesting.

SUMMARY

Alfalfa is an important crop. It is the sixth ranking crop in use of cultivated land in the United States, and fifth in Kansas. In tons of hay produced and in farm value of hay produced, alfalfa is the top-ranking hay crop.

Production of alfalfa seed is a vital agricultural industry if the total alfalfa acreage is to be either maintained or increased. Kansas normally produces more seed than any other state. Reno county has been the leading Kansas county in seed production while area 6B has been the leading type-of-farming area.

The most important reason why farm operators left alfalfa for seed in 1946 was the high price for which seed could be sold. Other important reasons were: Favorable weather conditions to produce seed; good bloom development made good seed crop look probable; shortage of labor to handle hay crop.

The main crop of seed came from the second cutting of alfalfa, although the third cutting was saved for seed on many fields. When the second cutting

was saved for seed, it required an average of 83 days to mature, August 15 being the average date harvested in 1946. Progressively shorter maturing periods were necessary when third and fourth cuttings were harvested for seed.

In this study there were 9,231 acres for which production could be determined. Average yield on those acres was 2.1 bushels per acre. Highest yield reported was 7.8 bushels per acre on a Hamilton county farm.

The outstanding method of harvesting used was to cut and windrow the crop with a mower and windrowing attachment, then pick-up combine out of that windrow. That method was used in 36 percent of the cases where method was determined and on 41 percent of the acreage for which method could be determined. Other important methods of harvesting are: Pick-up combining from windrows made by rakes; combining from standing plants; pick-up combining from windrows made by grain binders with tying and bunching mechanisms removed; binding, shocking and stationary threshing. Field combining (combining from standing plants, windrows, and swaths) was used in 67 percent of the cases and on 67 percent of the acreage harvested for seed on the surveyed farms.

The method of saving straw which was used the greatest number of times had the straw blown into a pile by the stationary thresher. The most popular method of saving straw following field combining was pick-up baling.

The average amount of labor used by the most common method of harvesting. was 1.5 man-hours per acre. Combining from standing alfalfa used the smallest amount of labor per acre, 0.9 man-hours. Labor for other methods ranged up to as much as 11.4 man-hours per acre for harvesting.

Cleaning of seed on the farm used an average of 0.15 man-hours labor per bushel. Hauling and marketing used only 0.04 man-hours labor per bushel.

No labor was charged to saving straw when it was blown into stack or barn from thresher. Pick-up baling straw used an average of 1.0 man-hour per acre. Labor for other methods of saving straw ranged from 0.0 to 2.8 man-hours per acre.

The average price per pound which farm operators received for seed sold was 35 cents for the survey as a whole. That average price depended largely on the price received for Kansas Common, the predominant variety. Buffalo seed sold for much higher prices. The survey average for that variety was 88 cents per pound.

Major cost-of-production items were ascertained directly from the survey. The other items were estimated in order to get a complete set of costs. Costs of harvesting, cleaning seed, hauling and marketing, and saving straw were divided into labor cost and machinery cost. A group of miscellaneous costs (including interest on land investment, land tax, overhead, stand depreciation and reseeding, and a few odd materials) added to the previous ones made up the complete set of costs. Total costs ranged from $9.59 to $11.44 per acre for 5 commonly used methods of harvesting.

Income per acre was made up of the values of seed, cleanings, and straw. These combined gave a total income of $50.30 per acre. Management income (difference between total cost and total income) ranged from $40.71 to $38.36 per acre for 5 commonly used methods of harvesting in 1946.

ACKNOWLEDGMENTS

For their services without which this study could not have been made, the writer expresses his gratitude to the Kansas farm operators who supplied the basic information.

For their helpful suggestions relating to the development of and presentation of the data, the writer is indebted to Dr. J. A. Hodges and other staff members of the Kansas Agricultural Experiment Station, and to M. R. Cooper, H. L. Collins and other members of the Bureau of Agricultural Economics of the United States Department of Agriculture.

REFERENCES

Brodell, A. P., and M. R. Cooper. Number and Duty of Principal Farm Machines. United States Department of Agriculture, FM 46. Washington: Bureau of Agricultural Economics, 1944.

Carlson, John W. Alfalfa-seed Investigations in Utah. Utah Agricultural Experiment Station Bulletin 258. 1935.

Grandfield, C. O., and E. I. Throckmorton. Alfalfa in Kansas. Kansas Agricultural Experiment Station Bulletin 328. 1945.

Hecht, Reuben, W. Farm Labor Requirements in the United States 1939 and 1944. United States Department of Agriculture FM 59. Washington: Bureau of Agricultural Economics, 1947.

Hodges, J. A., F. F. Elliott, and W. E. Grimes. Types of Farming in Kansas. Kansas Agricultural Experiment Station Bulletin 251. 1930.

Johnson, Neil W. Changes in Hay Production in War and Peace. United States Department of Agriculture FM 47. Washington: Bureau of Agricultural Economics, 1945.

Kansas State Board of Agriculture. Biennial Report of the Kansas State Board of Agriculture. Twelve reports. Topeka, Kansas: Kansas State Printing Plant, 1923-1948.

Klages, K. H. W. Ecological Crop Geography. New York: Macmillan, 1942.

Mercer, Ralph D. Alfalfa Seed Production. Montana Agricultural Experiment Station Extension Bulletin 218. 1943.

Morrison, F. B. Feeds and Feeding. Twentieth edition. Ithaca, New York: Morrison, 1940.

Sullivan, Wallace, and N. L. McFarlane. Alfalfa Seed Production Study Palo Verde Valley Riverside County 1946. Agricultural Extension Service University of California and United States Department of Agriculture. Riverside, California: Farm Advisor's Office, n.d.

Tysdal, H. M., and T. A. Kiesselbach. Alfalfa in Nebraska. Nebraska Agricultural Experiment Station Bulletin 331. 1941.

Tysdal, H. M., T. A. Kiesselbach, and H. L. Westover. Alfalfa Breeding. Nebraska Agricultural Experiment Station Research Bulletin 124. 1942.

U. S. Department of Agriculture. Agricultural Statistics. Nine volumes. Washington: Government Printing Office, 1938-1946.

U. S. Department of Agriculture. Agricultural Prices. Six issues. Washington: Bureau of Agricultural Economics, October, 1946 to March 1947.

Westover, H. L. Alfalfa Varieties in the United States. United States Department of Agriculture Farmers' Bulletin 1731. Revised Edition. Washington: Government Printing Office, 1946.

Willard, C. J., L. E. Thatcher, and J. S. Cutler. Alfalfa in Ohio. Ohio Agricultural Experiment Station Bulletin 540. 1934.

APPENDIX

The following appendix contains a copy of the questionnaire which was used to gather data for this study. Also it contains a copy of the "ice-breaker" letter which accompanied each questionnaire when it was mailed.

C O P Y

KANSAS STATE COLLEGE
of Agriculture and Applied Science
Manhattan, Kansas

Agricultural Experiment Station
Department of Agricultural Economics

February 17, 1947

Dear Sir:

It has been suggested that you may be willing to help with a study of the economic phases of the 1946 Alfalfa Seed Production in Kansas by answering and returning the enclosed questionnaire.

At first sight the questionnaire may appear to be long and complicated, but it really isn't. No one farm operator will fill in all the blanks, but rather he will fill in only those blanks which apply to him according to the method he used in harvesting his alfalfa seed in 1946. Most of the blanks can be answered by just one number or one word.

Section III, on Production, may appear most complicated of all. But you will see at a glance that all this Section needs is to call one of your alfalfa fields No. 1, and if you have another alfalfa field, call it No. 2. Then fill in the blanks to the right for each cutting on each of the fields.

For Section VIII, a crew means the number of workers who helped in performing the operation. Exchange workers are those men whose work you paid back by working for them. In the blanks of Section VIII give the number of each kind of worker in the crew and how long each of the workers worked at that job.

Of course we would like to have you fill out all the blanks which apply to your seed crop; but in case you can't fill in some of those, please send the questionnaire back with whatever information you can put in about your 1946 alfalfa seed crop. Any information you can send in will be helpful and greatly appreciated.

Sincerely thanking you in advance, I remain

Yours truly,

Robert E. Marx

Enclosure

C O P Y

ECONOMIC PHASE
KANSAS ALFALFA SEED PRODUCTION AND PRACTICES, 1946 CROP

Farm Operator: _____ Farm Location: _____, _____
Town County

Size of Farm and Tenure: Acres operated _____ Acres Owned _____; Acres Rented _____.

SECTION I: Organization of Farming Operations, 1946 Crop Season:

Crops Grown	Acres
Alfalfa (1 yr. old or older)	
Wheat	
Oats	
Corn for Grain	
Corn for Silage	
Sorghums for Silage	
Sorghums for Grain	
Soybeans	
Flax	
Other Crops:	
Wild Hay	
Permanent Pasture	
Other Land (Waste, Timber, Barnyard, etc.)	
Total Acres Operated	

Livestock	No. on Farm Jan. 1, 1947
Milk Cows	
Beef Cattle and Calves	
Sheep (Feeder and Breeding)	
Hogs (all)	
Horses and Mules	
Chickens	
Other Animals not Included Above:	

For those who IRRIGATE:

How many times did you irrigate for your Alfalfa HAY crops (only) in 1946? No._____

If you irrigated especially for the SEED crop, on what date was this irrigation?_____
Mo. Day

SECTION II: Practices:

Below are listed several reasons why an alfalfa grower might let a crop go to seed. Please indicate by a No. 1 which of these reasons was your OUTSTANDING REASON for having a seed crop in 1946, and indicate by 2, 3, etc., other reasons why you produced a seed crop.

Rank in Importance as 1st, 2nd,	Reason for Leaving Seed Crop
	A Regular, yearly practice on the farm.
	B Had particularly favorable weather conditions to produce seed crop.
	C The high price which seed would sell for.
	D Already had harvested enough hay to carry livestock through the winter.
	E Had poor hay crop prospects for the next cutting.
	F Needed some seed to plant.
	G The alfalfa field is at a distance from barnyard and feedlots so that a seed crop was preferred to hauling hay the long distance.
	H Needed cash for financial reasons.
	I Growing a certain variety of alfalfa, the seed of which is in particularly great demand.
	J Good bloom development made a good seed crop look probable.
	K Shortage of labor to handle hay crop.
	Other reasons: _____
	_____

Cutting	Field Number	ALFALFA CUT FOR HAY (If cut for silage or for dehydrator indicate on left side)			ALFALFA CUT FOR SEED			
		Date Cut	Acres Cut	Tons	Date Cut	Acres	Bushels Clean Seed	Bushels Uncleaned Seed
FIRST CUTTING	1.							
	2.							
	3.							
SECOND CUTTING	1.							
	2.							
	3.							
THIRD CUTTING	1.							
	2.							
	3.							
FOURTH CUTTING	1.							
	2.							
	3.							

How many acres are in field No. 1? _____; No. 2? _____; No. 3? _____.

Variety of Alfalfa in field No. 1, _____; No. 2, _____; No. 3, _____.

Age of stand in field No. 1, _____yrs.; No. 2, _____ yrs.; No. 3, _____yrs.

When you cut your Alfalfa for Seed, what percent of ripe (brown) pods do you like to be on the plants? _____% ripe pods.

How many times in the last 10 years have you had an Alfalfa Seed Crop on your farm? _____.

What has been the average yield per acre of the seed crops in the above question? _____ Bu. or Lbs.

Section IV --WAGES PAID TO HIRED WORKERS:

If you hired any men to work in harvesting your Alfalfa Seed crop, please give the number of men hired, the days that each of these man worked, and the wages you paid to each in the following blanks:

I hired _____ men for _____ days at $_____ per day or per hour,

and hired _____ men for _____ days at $_____ per day or per hour,

and hired _____ men for _____ days at $_____ per day or per hour.

The hired men worked _____ hours per day harvesting the Alfalfa Seed crop.

SECTION V: MACHINERY AND METHODS. - 3 -

In the following list indicate which implements you used in harvesting your 1946 Alfalfa Seed Crop by placing the number of each kind of implement used in the left hand blank (2 Mowers; 1 Rake, etc.) and give the size of each implement used where called for.

_____ 1. Mower, Horse drawn. Size, _____ ft.
_____ 2. Mower, Tractor drawn. Size, _____ ft.
_____ 3. Windrowing Attachment on Mower. Type _____.
_____ 4. Side-Delivery Rake, Horse drawn, Size, _____ ft.
_____ 5. Side-Delivery Rake, Tractor drawn. Size, _____ ft.
_____ 6. Dump Rake, Horse drawn. Size, _____ ft.
_____ 7. Dump Rake, Tractor drawn. Size, _____ ft.
_____ 8. Combine without pick-up attachment. Size, _____ ft.
_____ 9. Combine with pick-up attachment. Size of Combine, _____ ft.
Type of pick-up attachment used. _____.
_____ 10. Hay Loader.
_____ 11. Rack Wagons.
_____ 12. Stacker.
_____ 13. Buckrake, Horse drawn. Size, _____.
_____ 14. Buckrake, Tractor drawn. Size, _____.
_____ 15. Stationary Threshing Machine. Size, _____.
_____ 16. Other Implements, Name and Size: _____

_____.

SECTION VI: HOURS TO PERFORM OPERATIONS.

1. It took _____ hours to MOW the alfalfa seed crop.

2. It took _____ hours to RAKE the alfalfa seed crop.

3. It took _____ hours to Bunch the alfalfa seed crop.

4. It took _____ hours to Haul the alfalfa seed crop (before threshing).

5. It took _____ hours to STACK the alfalfa seed crop.

6. It took _____ hours to COMBINE the alfalfa seed crop.

7. It took _____ hours to THRESH the alfalfa seed with a STATIONARY THRESHING MACHINE.

8. It took _____ hours to CLEAN the SEED.

9. It took _____ hours to _____ the alfalfa seed crop.

10. It took _____ hours to _____ the alfalfa seed crop.

SECTION VII: CUSTOM HIRING.

What jobs in connection with the alfalfa seed harvesting did you hire done by custom work?

Job, _____; Rate of Pay, $ _____ per _____,
(acre, day or bushel)
including _____ men with the machine.

Job, _____; Rate of Pay, $ _____ per _____,
including _____ men with the machine.

SECTION VIII: OPERATIONS - CREWS - HOURS - 4 -

1. MOWING crew consisted of: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

2. RAKING crew consisted of: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

3. BUNCHING or COCKING crew: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

4. COMBINING (direct from standing Alfalfa) crew: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

5. COMBINING (from windrow) crew: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

6. HAULING to stack or thresher from the field: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

7. BUCKRAKING crew consisted of: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

8. STACKING crew consisted of: Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

9. THRESHING with stationary thresher: Farm Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

10. CLEANING the SEED. This crew consisted of: Farm Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

11. Other Operations: Name of Operation, _____.
This crew consisted of: Farm Operator working _____ hours,
_____ Family members working _____ hours each,
_____ Hired men working _____ hours each, and
_____ Exchange workers working _____ hours each.

SECTION IX: TIME ELAPSED BETWEEN OPERATIONS. - 5 -

1. How long did you let the crop cure before you windrowed it?___ Hours or___Days.
2. If you combined from the windrow, how long did you let the crop cure in the windrow before combining it? _____ Hours or _____ Days.
3. If you bunched or cocked the crop, how long did you let it stay in the windrow before you bunched it? _____ Hours or _____ Days.
4. How long did you let it cure in the cock before you hauled it to the thresher or to the stack? _____ Hours or _____ Days.
5. If you hauled from the windrow, how long did you let the alfalfa lay in the windrow before hauling it? _____ Hours or _____ Days.
6. If you performed any operations on your alfalfa seed crop before threshing that are not listed above, please give the operations and time elapsed since you did the previous job.

Operation: _____, _____ Hours after the job just previous
Operation: _____, _____ Hours after the job just previous

SECTION X: SAVING AND HANDLING THE STRAW.

If you saved the "Alfalfa Straw" after threshing,

1. How soon after combining or threshing did you handle the straw?__Hours or__Days.
2. What machines did you use in the operations of saving the straw? Machines:_____
_____.
3. Where was straw stored? _____.
4. How much time did it take to handle the straw?_____ hours or _____ days.
5. How many workers in this straw handling crew were: (a) Operator and/or his family? _____; (b) Hired men? _____; (c) Exchange workers?____; (d) Custom Workers? _____.

SECTION XI: GENERAL QUESTIONS.

1. On what date did you thresh the seed? _____ (month), _____ (day), 1946.
2. What was the total amount of seed produced? _____ Bu., or _____ lbs.
3. Where did you sell your seed? _____.
4. On what date did you sell the seed? _____.
5. How much seed did you sell? _____ Bu. or _____ Pounds.
6. At what price did you sell the seed? $_____ per Bu., or $_____ per pound.
7. How much seed did you keep for your own use? _____ Bu.
8. If you cleaned the seed, what did you do with the cleanings? _____
_____.
9. How many tons of Alfalfa hay do you figure your seed crop kept you from getting off your fields in 1946? _____ Tons not obtained.
10. What method did you use to harvest seed in 1945? _____.
11. What method of harvest do you plan to use for your 1947 seed crop? _____
_____.

If you RENT the alfalfa seed land, --

12. What EXPENSES in harvesting and marketing the alfalfa seed crop did your Landlord pay? _____.
13. How much of the seed went to your landlord as his part of the crop? _____
_____.